

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY:

DESIGNED AS
AN INTRODUCTION FOR STUDENTS,
AND
A CONCISE BOOK OF REFERENCE FOR PRACTITIONERS.

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AND ADDITIONAL NOTES,

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THIRD AMERICAN, FROM THE FIFTH LONDON EDITION,

REVISED AND CORRECTED.

IN TWO VOLUMES.—VOLUME I.

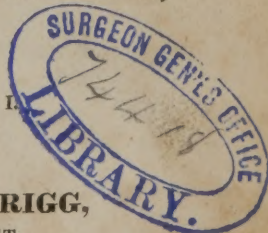
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EASTERN DISTRICT OF PENNSYLVANIA, TO WIT:

(L. S.) BE IT REMEMBERED, That on the eighteenth day of September, in the fifty-fifth year of the Independence of the United States of America, A. D. 1830, JOHN GRIGG, of the said District, has deposited in this Office the Title of a Book, the right whereof he claims as proprietor, in the words following, *to wit:*

"The First Lines of the Practice of Surgery: designed as an introduction for students, and a concise book of reference for practitioners. By Samuel Cooper, surgeon to the forces; member of the Royal College of Surgeons, and of the Medical and Chirurgical Society of London; member of the Medical Society of Marseilles; honorary fellow of the Academy of Natural Sciences at Catania, &c., &c. With Notes, by Alexander H. Stevens, M. D., professor of surgery in the University of New-York; surgeon of the New-York Hospital; consulting physician of the New-York Dispensary; member of the New-York Literary and Philosophical Society; of the Academy of Natural Sciences of Philadelphia; and of the Linnean Society of New-England. And additional notes, by Samuel McClellan, M. D., professor of anatomy in Jefferson Medical College, &c. Third American, from the fifth London edition, revised and corrected. In two volumes."

In conformity to the Act of the Congress of the United States, intituled, "An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned." And also to the Act, entitled, "An Act supplementary to an Act, entitled, 'An Act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies, during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL, Clerk of the
Eastern District of Pennsylvania.

NOTICE

TO

THE THIRD AMERICAN EDITION.

THE last edition of Mr. Cooper's "*Surgical Dictionary*" is about to be republished in New-York, with numerous notes, by an intelligent practitioner of that city. The enterprising publisher of this American edition of "The First Lines of the Practice of Surgery," has, therefore, considered it necessary to attach additional notes to the text, by way of illustration and improvement. It is questionable, however, whether the original work is not sufficiently copious for every purpose of reference;—while it is certain, that as a class-book, it is already too voluminous for the convenience of students. Although the editor has felt inclined to gratify the wishes of his estimable friend the publisher, nevertheless, he has been convinced, from a careful perusal of the work, that a few short and well selected notes, will prove more useful than any burthensome additions. The field of particulars in surgery, is almost boundless; and the moment we undertake to delineate its features, we transgress the limits of an elementary treatise.

The editor's notes are included between braces, thus { } at the foot of each page to which they refer. Mr. Cooper's original notes are without the braces. Dr. Stevens's notes are placed at the end of each volume.

Philadelphia, September 1st, 1830.

THE THIRD ANNUAL REPORT

OF THE

COMMISSIONERS OF THE LAND OFFICE

FOR THE YEAR 1883

IN RESPONSE TO A RESOLUTION OF THE HOUSE OF REPRESENTATIVES

PASSED MARCH 1, 1883

AND BY ORDER OF THE SENATE

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PREFACE

TO

THE FIFTH LONDON EDITION.



THE favourable reception, which this publication has met with, has encouraged me to revise the present edition with particular care. Several of the chapters in it are entirely new, as will be immediately perceived, on comparing those on the diseases of the eye and its appendages, with the account of the same subjects in former editions. A chapter on amputation of the lower jaw is introduced; an operation, of which I could find no satisfactory description in any general treatise on surgery, though its performance has now been repeatedly accomplished in France, America, Germany, and this kingdom, with a degree of success, that affords a convincing proof, in addition to many others, of the inestimable value of operative surgery, for the cure of the most intractable diseases. I am perfectly aware, that every new operation, upon its first introduction to the common notice of the profession, is liable to be occasionally practised under circumstances not absolutely requiring it. This sometimes happens from want of discrimination, but still more frequently, (I am ashamed to say,) from the base motive of making the operation itself a step to notoriety and unmerited reputation. Hence, I feel myself called upon to exhort the admirers of operative surgery, and every practitioner interested in the credit and improvement of his profession, never to suffer their love of extraordinary feats with the knife, or their greedy desire of fame, to make them forgetful of the

truth, that there is more real merit in removing the necessity for the practice of any one severe operation already familiarly adopted, than in the invention and performance of a hundred new ones. Let not the young surgeon be led to amputate the jaw for a disorder with which it is often attacked, and which is well known by the name of necrosis. I believe, that no simple necrosis of it, unattended with a fungous or medullary tumor originating within the bone itself, can ever be an instance in which amputation of the lower jaw is justifiable. Very large exfoliations take place of themselves; new bone is produced, as a substitute for what is lost; the swelling, thickening, and ulcerated state of the soft parts, all disappear; and, in the end, the patient recovers without deformity, and without the agony and danger of an operation, frequently long and severe, and always more or less mutilating. These observations seemed to me proper, as a caution that might usefully accompany this edition, in which a newish operation, attended with all its usual attractions, good and bad, is submitted to the notice of the profession. At the same time, I particularly request the reader to observe, that, in the chapter on this subject, the kinds of disease, for which the operation was deemed indispensably necessary, by surgeons of great eminence and judgment, are faithfully described.

May 17th, 1826.

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THE
FIRST LINES
OF THE
PRACTICE OF SURGERY.

CHAPTER I.
INFLAMMATION.

IN almost all the cases which fall under the care of surgeons, inflammation is more or less concerned, either as a cause, a symptom, a complication, or even as a means, or mode of cure. It may occur in any texture where blood-vessels are situated, and consequently nearly all parts of the body are liable to it. The symptoms, commonly indicating its presence, consist of pain, swelling, heat, and redness in the parts affected; but each of these effects does not prevail equally in every form of inflammation, and sometimes one or more of them may be nearly, or quite absent. Thus, in erythema, the redness is attended with little or no swelling; while, in particular states of chronic inflammation, a great deal of swelling may be accompanied with little or no redness, and with no sensation amounting to pain. Inflammation, then, is a process, liable to considerable variety, which is often regulated by the nature of its exciting cause, and frequently by that of the constitution, or the situation and structure in which it takes place. The differences, noticed in the character of inflammation, have led to the division of it into several kinds, as *acute* and *chronic*; *healthy* and *unhealthy*; *simple* and *complicated*. By *acute* is implied, that which produces all its effects quickly: its varieties are numerous, comprehending not only every instance of healthy, simple inflammation, but many other cases, justly regarded either as unhealthy or complicated. *Chronic* inflammation, on the

other hand, signifies that which is slow in its progress ; frequently beginning almost imperceptibly ; but sometimes coming on as the consequence of acute inflammation. It is to the changes produced by it, that the moderns impute almost all the slow thickenings of various textures, and the formation of the generality of indolent tumours. Many of its effects are exemplified in the ravages of scrofula, while the decline of acute inflammation into it is seen in every case of ophthalmy and gonorrhœa. By *healthy* inflammation, is meant that which is not characterized and modified by any particular disease in the part or constitution ; while the term *unhealthy*, is applied to cases, in which the appearances, progress, and termination of the inflammation, are under the influence of some determinate disease in the parts affected, or the system at large. By *simple* inflammation, surgeons understand, not only that it is of a healthy kind itself, but unconnected with any specific disease, like syphilis, fungus hæmatodes, cancer, &c., all which affections are frequently surrounded by inflammation, not of their own peculiar nature, yet deserving the appellation of *complicated*. Inflammation may also be said to be complicated, when attended with the lodgment of bullets, dead portions of bone, or other foreign bodies, which cannot be immediately removed.

Amongst the most remarkable effects of inflammation, is the permanent adhesion of parts to each other. The process by which such an union is formed, is certainly one of the most interesting operations of which the animal economy is capable ; for it is by means of it that wounds, fractures, and other serious injuries of the body are repaired, while numerous diseases not only receive a boundary from it, but are cured in a great measure by the changes to which it gives rise. Another frequent and important effect of inflammation is suppuration, or the production of the fluid named pus ; a third, is ulceration ; and the last to which I shall now advert, gangrene, or mortification. Hence, another common division of inflammation into the *adhesive* ; *suppurative* ; *ulcerative* ; and *gangrenous*. Frequently, an original disposition to one of these consequences prevails : thus, in boils and whitlows, there is always a tendency to suppurate, and in carbuncles, to slough. Certain kinds of inflammation, however, rarely, or never end either in suppuration, ulceration, or mortification ; but, however violent, ultimately subside without producing any of these effects, as exemplified in gout, and the inflammation called mumps. The course, indeed, which some inflammations follow, is so fixed, that it is very difficult, and generally impossible to alter it : thus, the gradual subsidence

of the swelling, known by the name of mumps, without any sore or abscess, is as constant as the suppuration of a whitlow.* Also, whether inflammation is to be the adhesive, suppurative, ulcerative, or gangrenous, often depends upon the particular situation and structure of the parts affected. In the cellular membrane, the body in general, its circumscribed cavities, deeply seated organs, and serous membranes, the adhesive inflammation is most disposed to happen;† while nearness to the surface of the body, and the texture of a mucous membrane, are circumstances facilitating the occurrence of suppuration.‡ In parts of inferior vascularity, like tendons, fasciæ, &c., inflammation readily occasions mortification.

Healthy inflammation, especially when situated near the surface of the body, is often named *phlegmon*, the symptoms of which are a throbbing pain, a firm, circumscribed swelling, an increased heat, and more or less redness of the parts affected. The redness does not terminate in an abrupt edge, like that of many other kinds of inflammation, but fades away imperceptibly in the surrounding skin. These local symptoms, when the disorder is severe, either on account of its degree, extent, or the nature of the parts affected, are constantly accompanied with a febrile disturbance of the whole system, named accordingly the *sympathetic* or *symptomatic inflammatory fever*.

There is reason to believe, that acute inflammation extends its effects to the whole of the circulating blood; for, when a portion of this fluid is discharged by bleeding, and afterwards examined in the basin, the appearances following its coagulation, are very different from those remarked in ordinary blood. The coagulation takes place more slowly, and generally more firmly than usual; and, when it is finished, a stratum of fibrine, which is generally of a yellowish buff colour, or rather like glue, and of greater or lesser thickness, is left upon the surface of the crassamentum, which itself often floats in an extraordinary quantity of serum. The stratum of fibrine, or of fibrine blended with coagulated albumen, here describ-

* See J. H. James on Inflammation, p. 16. 8vo. Lond. 1821.

† The cellular membrane is also liable to a species of inflammation, in which one remarkable feature is the little tendency to the effusion of coagulating lymph, so that the disorder is not circumscribed, but spreads under the integuments to a vast extent, attended with typhoid symptoms, and followed by suppuration. It is well described by Dr. Duncan, in the Med. Chir. Trans. of Edinb.; and by Dr. Scott, in the Edinb. Med. and Surg. Journ. No. 75. They name it *diffuse inflammation of the cellular membrane*. Authors mostly represent it as inflammation of fasciæ, or as a consequence of some kinds of erysipelas.

‡ Consult J. Hunter on the Blood, &c. 4to. Lond. 1794.

ed, is well known by the name of the *inflammatory crust*, or *buffy coat*; and blood, presenting the above-mentioned phenomena, is called *sizy*, in consequence of its being supposed to contain a preternatural quantity of fibrine, or glutinous matter. I know of no subject to which an intelligent experimenter could more usefully direct his researches, than that of the buffy coat of the blood, particularly with the view of ascertaining the circumstances influencing its formation. The surface of sizy blood is generally described as hollow, or *cupped*, as the phrase is; but whether it assumes this shape or not, always depends upon the particular state of the buffy coat itself. This is so much the case, that when the crust is thin and soft, the crassamentum adheres a good while to the sides of the basin, and the surface of the blood, instead of becoming concave, with its edges drawn inwards, or towards the centre, as the serum separates, is really flat, or even slightly convex. It is only when the buffy coat is thick and compact, when the coagulated mass soon separates from the sides of the basin, and floats in a large quantity of serum, that sizy blood presents a concave appearance. Another fact, made out in modern times, is, that when the buffy coat is thick and compact, the firmness of the coagulum, and its proportion of fibrine, are accordingly lessened; a circumstance, well deserving of attention, as it is a proof of the great tendency which there is in fibrine, during the existence of inflammation, to separate from the other constituent parts of the blood. Sometimes minute bubbles of air are seen under the buffy coat, resembling, in a particular light, small particles of oil; but the causes of this peculiarity are not understood.

The buffy coat is disposed to occur in the generality of inflammatory complaints, and occasionally in continued fever, intermittents, the scurvy, certain nervous affections, and most cases productive of febrile disturbance. De Haen noticed it on the blood of healthy persons, who had been bled in the spring as a matter of custom. Pregnant women, individuals who work hard in frosty weather, and soldiers, keeping watch at night in the cold season of the year, usually have sizy blood. The late Dr. Parry also met with persons whose blood was in this state, though no vestige of local inflammation could be discovered about them, and their pulse did not exceed sixty. On the other hand, cases are related, where inflammation prevailed in a severe degree, yet the blood discharged by venesection, was quite free from the buffy coat.* Sometimes in the same bleeding, the blood is buffy in one

* C. Heineker, Lond. Med. Repos. Feb. 1820.

basin, but not in another.* The causes of these and several other anomalies respecting sily blood, make it a subject yet requiring investigation, and, in truth, nothing whatever is known about the immediate cause of the buffy coat itself. The slow coagulation of the blood in inflammation, and the consequent gravitation of the red globules;† the size of the stream in which it issues from the vein; the shape and temperature of the basin or cup in which it is received; its exposure to, or exclusion from the air; are various circumstances, the effects of which have been attentively considered; but, hitherto, without throwing any material light on the present subject. The particulars, however, here explained, should lead us not to adopt, without some limitation, the doctrine that the buffy coat is a sure criterion of inflammation, and always a sufficient reason for bleeding. Considered with the state of the pulse, the situation and nature of the pain experienced, and other symptoms, it certainly forms a valuable guide in practice; and there are even some cases of internal inflammation, especially those in which the bowels are affected, where, on account of the small pulse, and general appearance of weakness, the practitioner would often be afraid to bleed, were it not for the instruction derived from the sily quality of the first two or three ounces of blood drawn for the sake of experiment.

Several of the symptoms of inflammation may be obscured, or essentially altered, in consequence of the particular situation, structure, and nature of the parts affected. The different effects, also, resulting from the disturbance of the functions of various organs, must obviously produce a material diversity in the symptoms. Thus, when the viscera, or other deeply seated parts, are inflamed, of course the swelling, redness, and throbbing, are not manifest to the eye or touch. But, though the diagnosis may receive no elucidation from these symptoms, the nature of the disorder still betrays itself by the inflammatory fever; the situation of the pain; the particular functions impeded or disturbed; and the sily appearance of the blood.

The redness of inflamed parts arises from the dilatation of small vessels, veins‡ as well as arteries, which become large enough to admit the red globules in abundance.§ This change

* Dict. des Sciences Med. tom. 7. p. 182.

† Hunter, Op. cit. pp. 313—315.

‡ Hunter on the Blood, &c. p. 282. Thomson's Lectures on Inflammation, p. 87. Op. cit. p. 283.

§ See NOTE A.

being completely visible, is one that must be received as undoubted truth, whatever may be the theory established respecting the state of other minute, discerning, or capillary arteries, which are sometimes inferred to be, not in a dilated, but a constricted state. Mr. Hunter had an idea that the redness sometimes partly depended upon the generation of new vessels. In ordinary cases, however, none of the redness can be ascribed to it; for, a part may be reddened in a few seconds by friction, the application of heat, &c., in which circumstance, there cannot be time for the formation of additional vessels. The fact, also, of many parts, which are naturally colourless, being rendered quite red by anatomical injection, tends to prove that the distention of such vessels as already exist, may account for a great increase of redness. Yet we are duly to remember the curious circumstance of blood-vessels becoming visible during inflammation in organs, which can never be made to indicate any vascularity, as far as can be learned from the use of fine anatomical injections; a fact, which induces Meckel* to adopt the Hunterian doctrine, that new vessels are sometimes actually produced in inflammation, particularly when it affects parts of inferior vascularity, like the cornea.

Perhaps, however, his view of this question does not gain much support from the circumstance of inflamed parts exhibiting a vascularity, which could not be demonstrated in their healthy state. On the contrary, I believe, that inflammation can never happen, except where vessels are situated. All the phenomena of this process are a proof of their presence. That it enlarges them, and renders them capable of receiving red blood, is perfectly certain; and it is on this principle, that we can account for their becoming visible, when no injection would perviate them in their ordinary state. In short, no sound physiologist will argue, that parts are not vascular, because the vessels cannot be discerned; and he judges of the question more accurately, by considering what mutations each structure exhibits in health and disease. Whatever doubts, however, may attend this subject, with respect to the more familiar examples of inflammation, it is universally allowed, that new vessels are frequently developed in the coagulating lymph, on the surfaces of inflamed serous membranes, in fresh wounds, in many instances of chronic inflammation, and in new growths.

In cases of ophthalmy, the surgeon has an excellent opportunity of observing the dilatation of the vessels, and the conse-

* See Meckel's *Handbuch der Pathologischen Anatomie* 2ter. b. 2ter. abth. p. 23. Leipzig. 1818.

quent appearance of redness : enlarged vessels, which naturally held only a colourless fluid, not only present themselves in myriads upon the conjunctiva, but extend their branches over the cornea itself. The enlargement of the smaller vessels, and the increase in the number of those, which become capable of containing red blood, are facts which can be seen with the naked eye ; and they may be rendered still more obvious by means of the microscope, and the art of injecting. Hunter froze the ear of a rabbit, and thawed it again. A considerable inflammation, and an increased heat, and thickening of the part, ensued. While the ear was violently inflamed, the animal was killed ; its head injected ; and its ears removed and dried. The uninflamed ear, when dried, was clear and transparent, and its vessels could be plainly seen ramifying through its substance ; but, the inflamed ear, when dried, was thicker and more opaque, its arteries being considerably enlarged.*

The swelling and tension of inflamed parts proceed from the dilatation of the vessels ; their turgid state ; the extravasation of serum and coagulating lymph ; and the interruption of absorption.† That the extravasation of coagulating lymph has a remarkable share in producing the swelling of inflamed parts, is unquestionable ; for it fills up all their interstices, glues their whole structure together, and consolidates them into one mass. Frequently, when its quantity is considerable, it is converted into a true cellular, or membranous texture, or assumes, more or less, the peculiar qualities of different organs. This is very evident in the bones. By means of such change, also, several loose parts may acquire the external properties of denser organs. Thus, the lungs are sometimes turned into a liver-like substance, a morbid alteration long since described by Morgagni, under the name of "hepatisation."‡

According to Hunter's experiments, the temperature of an inflamed part, as indicated by the thermometer, is much lower than what the feelings of the patient would lead one to suppose ; and he was inclined to think, that it never exceeds that of the blood in the heart. By artificial means, he excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to detect any considerable rise in the temperature of those parts. In a patient, however, upon whom he had operated for hydrocele, the rise was much more remarkable ; for, a thermometer, introduced

* Hunter on the Blood, &c. p. 280.

† See Soemmering *De Morbis Vasorum Absorbentium*, 8vo. 1795.

‡ *De Sedibus et Causis Morb. Epist. An. Med. XXI. 2. 13. 17. 19. 27.*
 Meckel, *Handbuch der Pathologischen Anatomie*, b. 2. abth. 2. p. 26.

into the tunica vaginalis immediately after the operation, indicated a temperature of only ninety-two degrees; but, on being again introduced the following day, the quicksilver rose to ninety-eight and three quarters. Yet, even in this case, it was supposed, that the temperature of the inflamed parts was less than that of the blood near the heart.*

It is more easy to conceive than describe how any quick deviation from the natural state of parts must excite pain. In chronic inflammation, the graduality of the change allows the nerves to become adapted to it, and the degree of pain only amounts to a dull uneasiness: but, in phlegmon, the change being quick, the pain is considerable. Each kind of inflammation seems to have its particular sort of pain. Thus, phlegmon excites a pain, which is joined with a sense of throbbing and heaviness; erysipelas gives rise to a pungent itching kind of pain; and anthrax causes a pain, characterized by a sensation of burning and stiffness. Some organs, which naturally possess little sensibility, are remarked to become exquisitely painful, when inflamed; a curious fact, of which there are continual proofs in the practice of surgery.

The throbbing is sometimes described as depending upon the strong pulsation of the arteries, which are alleged to beat in many instances with preternatural force, not merely in the seat of the inflammation, but for some way from it towards the heart. "Inflammation," says Mr. Hunter, "is not only an action of the smaller vessels in the part itself, but in the larger vessels leading to it. This is proved in whitlows, where the inflammation and throbbing pain are confined to the extremity of the finger; yet, when we grasp the finger, a strong pulsation is felt in the two arteries leading to the inflamed part, while no such pulsation can be felt in the other fingers. If the inflammation be very considerable, the artery, as high as the wrist, will be sensibly affected."† The preceding fact, though not advanced by Hunter for any such purpose, is always strongly insisted upon by certain authors and lecturers, who inculcate the doctrine of the arteries contracting with increased force in inflammation, as a complete proof of their hypothesis. But this mode of accounting for the throbbing is not universally admitted; and Hunter himself was far from drawing any such conclusion; for all that he presumes to say, is, that the increased throbbing, felt in the inflamed part, and for some way from it, proves that the arterial system is *dilating* itself, and allowing more blood to pass than usual.

* Hunter on the Blood, &c. p. 293.

† Op. cit. p. 278.

The very first act of the vessels, when the stimulus which excites inflammation is applied, is exactly similar to a blush; simply, an increase or distention beyond their natural size. Afterwards a new action begins, which is probably the separation of the coagulating lymph, and the throwing of it out of the vessels,* together with a proportion of serum, which is the cause of the soft, doughy, œdematous tumour often seen about an inflamed part.

Inflamed serous membranes very readily effuse coagulating lymph, which also becomes vascular and organized, with great rapidity, so as to complete the stages of adhesive inflammation. In this way are produced those unchangeable adhesions, which are so commonly found between the lungs and pleura costalis; and between the intestines and peritoneum. A similar effusion may take from inflamed mucous membranes, especially those of the alimentary canal, larynx, and trachea, the products of the effused lymph, assuming the form of hollow or solid cylinders, corresponding to these canals in shape;† but this only happens when mucous membranes are the seat of violent, or peculiar inflammation, and, under other circumstances, they more readily effuse pus, than coagulating lymph. Also, when coagulating lymph is effused upon the surface of a recent wound, or the ends of a broken bone, it changes into a vascular mass, which ultimately forms a permanent bond of union between the parts.

New vessels are sometimes developed in coagulating lymph with surprising quickness. One morning, at seven o'clock, Sir E. Home‡ operated upon a man, who had a strangulated femoral hernia. The hernial sac was opened, and found to contain a portion of bowel six inches in length, which, on careful examination, seemed quite smooth, and without any extraordinary appearance of vascularity. Nine-and-twenty hours after the operation, the patient died, having had scarcely any pulse during the last five hours of his existence. On dissection, the strangulated part of the bowel was found highly inflamed, its external surface soft, and covered in several places with coagulating lymph. A fine injection penetrated all these distinct portions of lymph, demonstrating in each a considerable artery, accompanied with a large vein. The coagulating lymph then had been manifestly effused after the operation; and, as from the almost lifeless state of the patient during his

* Hunter, p. 270.

† Meckel, Op. cit. b. 2 abth. 2 p. 30. See also the appearances in Croup, as delineated in Baillie's plates of Morbid Anatomy.

‡ On the Properties of Pus, p. 41.

last five hours, we cannot suppose that any new vessels could be formed during that period, it follows, that they can be produced in a space of time less than twenty-four hours. The case also proves that such vessels inosculate with the old, or original ones.

According to Meckel,* the new vessels are only extensions or continuations of the old ones. Soemmering† relates several cases in which it was demonstrated by injections, that the vessels, produced in membranous adhesions of the chest, did not proceed from the lungs to the pleura, but originated from this last membrane in the situation of every intercostal artery. The thing is represented in the same way by Monro.‡ A large membranous adhesion, which connected the intestine and peritoneum together, derived its vessels also from those of the latter membrane.

In the centre of the extravasated substance, which connected inflamed parts, and on the surfaces after separation, Hunter frequently noticed small specks of red blood: these could hardly have been extravasated with the coagulating lymph; for they would then have been more diffused, plainly connected with the vessels, and not situated within the lymph. A corresponding extravasation would also have resulted from injections, which was not the case. Hence Mr. Hunter was led to conclude that the blood was produced in the new-formed coagulum itself, exactly as in the incubated egg, blood is formed at distinct unconnected points; and Meckel thinks the account is rendered more probable, by the fact of the formation of blood and vessels in this new structure, going precisely through the same stages as the incubated egg; inasmuch as at first merely tubes for the blood can be discerned, but nothing like regular vessels.§ However, if a statement made by Sir A. Cooper in his lectures be correct, Mr. Hunter renounced this doctrine previously to his death; and adopted the opinion, that the new vessels always shoot from the old ones into the coagulating lymph. This is also the view which Sir Astley himself entertains.

Whatever may be the situation of inflammation, it is always most violent on the side nearest to the external surface of the body; a curious fact, first pointed out by Mr. Hunter, and so constant, that it may be regarded as a sort of law in the animal economy, the usefulness of which in creating a tendency

* Handbuch der Pathol. Anat. b. 2. abth. 2. p. 32.

† Transl. of Baillie's Morb. Anat. p. 32. note 67.

‡ Obs. on the Nervous System, pl. 13.

§ B. 2. abth. 2. p. 33.

in many diseases not to spread deeply, must be sufficiently manifest.

The causes of inflammation are divided into the *remote* and *proximate*. The epithet *remote* is badly chosen; for it comprehends many things which contribute immediately, as well as remotely, to the production of inflammation. In most instances, we are able to trace the origin of this process to causes, which act either directly upon the part affected, or indirectly upon it through the medium of those inexplicable sympathies, which connect distant parts of the body with one another. As illustrations of the latter remark, Professor Thomson, of Edinburgh, adverts to the effects of particular kinds of food, and of small doses of mercury, or arsenic, which, after being taken into the stomach, sometimes produce distinct and specific inflammations of the cutaneous texture. The exposure of the feet to cold, he also observes, occasions in one person an inflammation of the throat; in another, an inflammation of the chest; and, in a third, an inflammation of the belly.* The expression, *exciting* causes, which is sometimes employed, is more correct than the term *remote*. These remote or exciting causes of inflammation are very numerous; but, as they mostly admit of being referred to external violence or irritation, from mechanical or chemical means, a full detail of them would be superfluous. Suffice it to say, then, that wounds, fractures, contusions; the lodgment of a thorn, bit of glass, or other extraneous bodies in the flesh; a scald, or burn; exposure to cold; and the application of innumerable irritating substances to parts; are common exciting causes of inflammation. Fevers often appear to have a similar effect. Sometimes inflammation arises spontaneously, or (to speak more correctly) no perceptible cause can be assigned for it.

By the term *proximate* cause, pathologists generally imply that state of the part affected, upon which the phenomena peculiar to inflammation immediately and primarily depend. They mean, in fact, that secret process, that first essential action in the part, which constitutes the very beginning of inflammation, keeps up its progress, and is inseparably connected with its existence.

While Galen and Boerhaave ascribe the proximate cause of inflammation to particular states of the blood and humours, Stahl, Gorter, Hunter, and Cullen, all concur in imputing it rather to an affection of the vessels. If the state of the whole mass of the blood were the cause, why should inflammation

* Lectures on Inflammation, pp. 50, 51.

be confined to any particular part? It is a general opinion, that a larger quantity of blood is determined to an inflamed part than in the natural state.* If an incision be made into it, the blood gushes out more profusely than from a cut in a similar part free from inflammation. Now, although this does not completely prove that there was actually an accelerated flow of blood through the inflamed part previously to the incision, it is a phenomenon which cannot arise from any peculiarity in the action of the heart; an organ, which drives the blood equally into the whole arterial system. The fact must be referred either to the augmented diameter of the vessels of the part affected, or to the peculiar property of the arteries, which, in the healthy state, at least, are not simple mechanical tubes for the transmission of the blood, but active instruments in the promotion of the circulation, possessing, besides their elasticity, a vital power of action, arising from their muscular structure.

We have mentioned the dilatation of the small vessels, as one of the earliest perceptible changes in the process of inflammation. Several lecturers, I observe, do not describe the dilated state of the small arteries of an inflamed part as regular and permanent, but as joined with alternate, proportionately increased contractions. No doubt, this notion of the nature of the increased action in inflammation, is derived partly from the throbbing in phlegmonous swellings, and partly from the recollection of the natural systole and diastole of the arteries in the healthy state; but its correctness has not yet been proved either by experiment or observation.† Professor Thomson and Dr. Parry could see no such motions in the small arteries, which were microscopically examined in their experiments relative to inflammation, and Mr. Hunter is so far from countenancing this supposition, that he gives a decided opinion, “that in inflammations the muscular coats of the arteries do not contract.”‡ When, therefore, he describes inflammation as an increased action of the vessels, he does not imply that such action consists in increased dilatations and contractions, alternately performed. The dilatation of the vessels of an inflamed part is a subject on which he displays a great deal of ingenious reasoning. The muscular power of the arteries seems to him to give way in inflammation, because they are more dilated than their natural elasti-

* Mr. Hunter every where expresses his belief, that the blood circulates in greater quantity, and with increased velocity, through inflamed parts.

† Thomson's Lectures on Inflammation, p. 73.

‡ On the Blood, &c. p. 283.

city would allow, which must also be increased. He conceives that this change is something more than simply a common relaxation; "we must," he says, "suppose it an action in the parts to produce an increase of size for particular purposes," and this he would call the "action of dilatation." He compares it with the increase of the size of the uterus in pregnancy, with the enlargement of the os tinæ in the time of labour; the consequence of the preceding actions, and necessary for the completion of those which are to follow.*

That the proximate cause of inflammation cannot be satisfactorily explained, upon any principle hitherto suggested, must be acknowledged; for, there must be something besides merely an increased action of the vessels; there must be something besides an enlargement of their diameters, to constitute inflammation. Both these changes happen to the external carotids in the growth of the stag's horns; to the spermatic arteries of animals, which copulate only at certain seasons of the year; and to the arteries of the uterus in pregnancy. Such changes probably always happen, whenever there is any process going on in the animal economy requiring an extraordinary supply of blood:† still, in the instances now mentioned, there is no inflammation, no pain, no symptomatic fever. A simple inequality in the distribution of the blood, therefore, uncombined with other causes, cannot account for the origin of this process.

A very opposite theory to that which prevails in the schools of medicine in this country, was entertained by Vacca,‡ Mr. Allen, of Edinburgh, &c. They supposed the action of the vessels of every inflamed part to be diminished; and that there actually existed in it a congestion of blood, proved by the increase of bulk and redness of the small arteries, and by the increased flow of blood, when an inflamed part was divided.

The sense of throbbing, Allen, Callisen, &c., attribute to the difficulty which the blood meets with in passing from the arterial trunk into the capillary branches;§ and the former considers it as no criterion of the force with which the artery

* Op. cit. p. 282.

† Hunter, p. 283.

‡ Liber de inflammationis morbosæ, quæ in humano corpore fit, natura, causis, effectibus, et curatione. Flor. 1765.

§ Arteriæ minores pressione sanguinis irruentis calidioris dilatatæ atque elongatæ, in ductos serpentarios flecti, et sanguinem prementem ægre promovere videntur, non in ipsa parte adfecta solum, sed in vasis circumjunctis quoque; inde pulsatio in parte inflammata. (Callisen. t. i. p. 191.)

contracts, since it is produced during the diastole of the vessel, and by a power foreign to it.

Attempts have been made to support the doctrine of the diminished action of the inflamed vessels, by an appeal to experiment, and Dr. Philip and Mr. Boraston, undertook some investigations, from which it was concluded, that, in the arteries of inflamed parts, the circulation is slower, than in those of uninflamed parts.* Professor Thomson also instituted experiments, for the purpose of settling this disputed point, and he infers, that inflammation is sometimes attended with an accelerated, and sometimes with a retarded circulation through the capillary vessels of the inflamed part; consequently, that neither of these changes ought to be included in a definition of the process.†

Whatever may be the real state of the capillary vessels in a part affected with acute inflammation, I believe that none of the experiments, hitherto made in relation to this point, have cast any doubt on the truth of the generally received doctrine, that there is an increased determination of blood to the part itself. Such augmented flow of blood to a limited point of the animal machine, cannot be produced by the action of the heart, but must arise, independently of it, from a power possessed by the vessels themselves; the same kind of power which occasions an increased determination of blood to the cheeks when a person blushes, and which injects the corpora cavernosa under venereal excitement. Unless it be admitted, that there is an accelerated flow of blood at least to an inflamed part, if not completely through all its minute arteries and veins, it is difficult to account either for the rise in its temperature, or the efficacy of measures calculated to lessen the force of the circulation.‡

TREATMENT OF PHLEGMONOUS INFLAMMATION.

The first object in the treatment naturally consists in removing the causes of the disorder. If the irritation of a splinter were to give rise to phlegmonous inflammation, who would not of his own accord extract the offending substance? But

* Wilson Philip on Febrile Diseases, part 2. Callisen expresses a similar belief: "*Neque tamen ideo obstructio sanguinis stagnatio adest in arteriis sic affectis: quem certe propulsant atque transmittunt in venas respondentes, licet non satis expedite, nec integra quantitate accepta.*" Syst. Chir. Hod. Pars 1. p. 191.

† Lectures on Inflammation, p. 75, &c.

‡ See Quarterly Journal of Medical Sciences for Oct. 1825, p. 650.

the removal of the stimulus producing inflammation will not always put an immediate stop to it ; for the living parts have been injured, and this process is necessary for their reparation. In this point of view, it can only be regarded as hurtful, when its violence and intensity are likely to prevent the accomplishment of the salutary ends for which it generally commences.

In whatever manner the several differences, respecting the nature of inflammation, may be hereafter reconciled, it will always be a primary indication to diminish, by means of bleeding, or other expedients, the quantity and impetus of the blood flowing towards the inflamed part. The utility of this maxim is so confirmed by experience, that, whatever may be the theory espoused concerning the state of the capillary vessels in an inflamed part, no difference of opinion prevails with respect to the rule of practice. Indeed, at the present day, surgical ingenuity is constantly active, in devising plans for carrying this principle into execution with the greatest effect ; and even the bold measure of tying large arteries, for the relief of inflammation, has been both recommended and tried. Such treatment, though unnecessary in ordinary cases, may not be decidedly improper in others of a more urgent nature ; like the dangerous kind of inflammation resulting from wounds of the knee, and bad compound fractures and dislocations.

General bleeding, by which we are to understand the extraction of blood from a largish vessel at a distance from the inflamed part, is sometimes less advisable than *topical bleeding*, or the taking away of blood from the inflamed part itself, or its vicinity, by means of leeches, cupping, &c. The nearer the bleeding is to the seat of inflammation, the more efficacious it is, and the less the occasion for taking away such a quantity as might be followed by an unnecessary degree of weakness. In all cases of urgency and importance, however, general bleeding is indispensable ; and, in many instances, the surgeon is obliged to employ venesection, or arteriotomy, not merely once, but repeatedly, in conjunction with leeches and cupping. The necessity of such practice is often exemplified in wounds of the head, chest, and abdomen ; and in cases of inflammation within either of those cavities ; or affecting any of the large joints ; or so delicate an organ as the eye.

The efficacy of bleeding is greater, the sooner it is practised, and the more suddenly the blood is evacuated. Hence the utility of sometimes making the opening in the vein large, especially in cases, where the patient's safety absolutely de-

pend upon an immediate stop being put to the inflammation. The fainting, frequently produced in this manner, causes an immediate, but temporary, suspension of every operation in the system, and, amongst others, of the process of inflammation.

Topical bleeding can only be powerfully efficacious, when general plethora has been previously removed; but if no plethora, and not much fever exist, it may have immense effect; and, as Dr. Thomson truly remarks, whenever any doubt arises, with regard to the propriety of venesection, it may be laid down, as a common rule, that it is safer to employ local, than general bleeding.*

Whenever general bleeding is requisite, the quantity of blood to be taken away should be determined by the united considerations of the organ affected, the severity and urgency of the symptoms, the strength and age of the patient, the state of the pulse, and the appearance of the blood itself, in relation to the buffy coat. In injuries of the brain and lungs, the patient's sole chance of recovery often depends upon the boldest use of the lancet; and, in the records of surgery, many instances are to be found, in which life seems to have been saved by the sacrifice of two or three hundred ounces of blood in the short space of a few days.

Mild saline purgatives not only diminish the quantity of circulating blood, by the increased secretion which they occasion in the alimentary canal, they operate specifically, in lowering all the operations of the system, and must, therefore, tend to subdue inflammation. As they have not so debilitating an effect as bleeding, they are seldom omitted, even when this is considered unnecessary. The most eligible are the sulphates of soda and magnesia; and the tartrate of potass, alone, or joined with the infusion of senna. For cases requiring the bowels to be opened without the least irritation, the oleum ricini deserves to be particularly recommended. As drastic purgatives mostly produce irritation, they are not prescribed in ordinary cases of inflammation. But the submuriate of mercury is not unfrequently employed, particularly in children, and in other subjects, whose chylopoietic organs are disordered. When necessary, the operation of purgatives is to be assisted with clysters.

Nauseating doses of tartarised antimony prove advantageous in several ways; they relieve that oppressive dryness of the skin which accompanies the fever attendant on severe

local inflammation; they diminish the increased action of the heart and arteries in general; they tend to restore the secretions in general; and, lastly, they promote the removal of costiveness. Whenever nausea is produced, the whole constitution sympathizes with the stomach, and is immediately thrown into a temporary state of debility, every considerable operation in it being checked. Hence, when there is urgent reason for putting a sudden stop to inflammation, this use of antimonials ought never to be neglected, as in inflammation of the brain and its membranes, arising in consequence of external violence; inflammation of the larynx; various forms of acute ophthalmy, &c. On a similar principle, digitalis is also sometimes prescribed, though its good effects are more doubtful.

The practitioners of this country, considering opium as a stimulant, seldom employ it in cases of phlegmonous inflammation, except when the pain is extremely severe. Given at an early period, in acute inflammatory diseases, it never fails to excite vascular action, and to aggravate all the symptoms of fever. Therefore, says Dr. Thomson, it is not to be used, except for the purpose of allaying the pain and irritation arising from an operation, or a recent external injury; and he thinks that it should be generally omitted even after an operation, except when the patient is very nervous, and complains of severe pain.* The preparation of opium, called morphine, which contains the sedative virtues of the medicine, separated from its stimulating properties, is that which seems best calculated for cases of inflammation.

The patient should abstain from fermented and spirituous liquors, and animal food, confining himself to vegetable diet, gruels, slops, tea, acidulated drinks, dry toast, &c. Sweet acid fruits, and common saline draughts, have a good effect in quenching thirst, and keeping the bowels open. Above all things, quietude is to be enjoined. The patient's chamber ought to be temperately cool, and he should not be covered with too much clothing. Another object of considerable importance, is never to let an inflamed part continue in a depending position, which always retards the cure, and frequently renders the symptoms much worse, by checking the return of the blood through the veins.

Heat naturally promotes all processes taking place in the animal economy, and hence it must have a bad effect on every inflammation disposed to rise above the degree necessary for

* Lectures on Inflammation, p. 72.

the restoration of the parts to their healthy state. It is, therefore, a common indication, to diminish the temperature of inflamed parts, by covering them with cold applications, and keeping up from their surface a continual evaporation. The lotions, most frequently employed for this purpose, consist either of one part of rectified spirit of wine mixed with five of cold water; the liquor plumbi subacetatis dilutus; or a solution of a dram of the sulphate of zinc in a quart of common water. Linen, kept constantly wet with either of these lotions, is to be applied to the part affected.

In inflamed parts, absorption seems to be more or less interrupted. Hence the great benefit resulting from discutient lotions, in all cases where the extravasation of blood and coagulating lymph is considerable. For the inflammation following contusions, concussions, and sprains, such applications are frequently the best which can be employed. A good lotion of this quality is the following: *R Ammon. muriatæ ℥ss., aceti et spirit. vini rectific. sing. ℥bj. M.*, or one composed of the liquor ammoniæ acet. alone, or mixed with equal parts of spirits of wine, and distilled water. When the inflammation is slight, and the swelling and extravasation great, the surgeon may sometimes venture to use liniments.

The fact is curious, but perfectly confirmed by experience, that inflammation is sometimes most benefited by cold applications, and sometimes by warm emollient poultices and fomentations. Although, in the early stage of the greater number of phlegmonous inflammations, cold astringent lotions are preferable to warm applications, it is occasionally otherwise, and either from singularity of the patient's constitution, or, in consequence of the structure, situation, and nature of the inflamed part, they do not produce their usual good effect. An inflamed testicle, and the incipient stage of acute ophthalmy, generally receive more benefit from emollient fomentations and poultices, than from cold astringents. Inflammations, not admitting of a cure without suppuration, should also be treated with emollients; for the sooner the matter is formed, the sooner the inflammation will end. Such is the inflammation caused by fevers, contused wounds, boils, and carbuncles.

One of the best emollient poultices is that made of linseed meal, which should be gradually mixed with hot water, until the mass is of proper consistence. A little oil is often added, which prevents the poultice from becoming dry and hard.

An eligible fomentation is thus made: *R lini contusi ℥j. chamœmeli ℥ij. aquæ distil. ℥vj. paulisper coque et cola.* When the pain is exceedingly severe, the following one fre-

quently produces great relief: R papaveris albi exsiccati ℥iv. aquæ puræ ℥vj. coque usque remaneant ℥ij. et cola.

The most common way, in which inflammation ends, consists in a gradual abatement of the pain, redness, swelling, throbbing, and heat of the part, without any formation of matter, or permanent injury of structure. This is termed *resolution*, and is the best manner in which inflammation can terminate.

The next most frequent termination of phlegmon is in the production of pus, termed *suppuration*; a state, however, in which there is rather a modification of the inflammation, than a cessation of it.

The other manner in which inflammation ends, is in the death of the part affected—mortification; the worst, but, happily, the least frequent, result of common inflammation.

Every part, just recovered from the violence of phlegmonous and other kinds of inflammation, may be regarded as still imperfect, and, sometimes, in consequence of the loss of tone, induced in the vessels, a languid or chronic inflammation succeeds, which cannot be overcome, without great difficulty. Hence, however improper stimulants, astringents, and corroborants may be, as local applications, during the violence of inflammation in very sensible organs, they are generally highly proper the moment that stage ceases. Thus, emollients, which, for the first day or two, are serviceable in acute ophthalmy, afterwards act prejudicially, in consequence of their relaxing nature.



CHAPTER II.

OF THE SYMPATHETIC, OR SYMPTOMATIC, INFLAMMATORY FEVER.

AFTER being informed that the mass of circulating blood becomes affected in cases of inflammation, we must expect to find traces of constitutional, as well as of local disturbance. The name of the fever attendant on inflammation is derived from its being, as it were, one of the symptoms or effects of the local disorder, and the sympathy of the whole constitution with the disturbed state of a part. It is called inflammatory, because it is accompanied with an increased action of

the heart and arteries, and with what is termed a *phlogistic* type. The symptoms are, a frequent, strong, and full pulse; headach: loss of appetite: nausea, and sometimes vomiting; constipation; an increase of the temperature of the whole body; a hot dry state of the skin; a dry, white, furred tongue: great thirst; universal disturbance of the nervous system; restlessness; anxiety: loss of sleep; and, in some cases, there is delirium. Perspiration is not the only secretion which is diminished: all the other secretions are similarly affected. For instance, the flow of saliva into the mouth is diminished, and ulcers and other surfaces secreting pus are dried up upon an attack of fever. The urine is not only diminished in quantity, its chemical properties appear to undergo considerable alterations. Though of a high colour, it deposits upon standing no lateritious sediment, or uric acid, as it almost constantly does the moment the fever begins to abate.* The impediment to the various secretions in the alimentary canal may also account for the constipation.

Such is the general nature of the febrile symptoms, when any considerable degree of phlegmonous inflammation affects common parts, like the integuments; the disturbance of the system being in a great measure proportioned to the extent and violence of the local affection.

The effects of inflammation on the constitution, however, are not simply in a ratio to its extent; but are influenced as much by the nature of the parts, in which it is situated, as by its quantity.

When muscles, cellular membrane, skin, &c., are inflamed, the pulse is, as we have described, strong and full. These may be said to be common structures.

If the inflammation be in tendinous, ligamentous, or bony parts, the stomach sympathizes more than when muscles, &c., are inflamed. The pulse is quicker, but not so full, and the blood, not being propelled so far into the small vessels, forsakes the skin.

When inflammation is in vital parts, or such as sympathize with the stomach, there is great depression blended with the constitutional symptoms; the pulse is frequent and small, and the blood is not pushed into the minute vessels. A remarkable depression of strength frequently attends an inflammation of the intestines, and the pulse is small and hard; whereas, when the surface of the body is the seat of the affection, there is often a temporary augmentation of tone, with

* See Thomson's Lectures, p. 115.

a full, strong, and hard pulse. In fact, when the peritoneum and intestines are inflamed, the patient frequently seems so reduced, and his pulse so small, that the surgeon is afraid to use the lancet. Perhaps, however, he ventures to do so; the blood is found to be sizy, and the pulse gains strength, in proportion as the disease is benefited by the evacuation.

When the constitution is good, and parts not very essential to life are inflamed, the strength and fulness of the pulse are increased. When the same parts are affected in weak irritable persons, and in women who lead sedentary lives, the pulse is quick, hard, and small, at the commencement of the inflammation, just as if vital parts were concerned.

Thus, we see, that all the varieties of inflammatory fever depend chiefly on four circumstances; viz. the extent of the inflammation; the structure of the parts affected; their functions; and the nature of the constitution.*

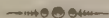
If continued beyond a certain period, the common inflammatory fever always has a tendency to change into *hectic*; a species of constitutional disorder described in a future chapter, and invariably attending all long-continued profuse suppurations, as well as every other surgical disease, which keeps up for a considerable time a general disturbance of the health.

As the cause of the sympathetic inflammatory fever is the local inflammation, it is obvious, that while we are endeavouring to cure the latter, we are taking the most effectual steps for the relief of the constitutional disorder. But, as excessive febrile disturbance may, in its turn, have a bad effect on the local complaint, it is sometimes proper to endeavour to palliate the constitutional symptoms, by having recourse to such means as would not be necessary, were the inflammation not likely to be aggravated by the fever.

The frequency, strength, and fulness of the pulse are to be diminished by the use of the lancet, the exhibition of saline purgatives, the nitrate of potassa, and, in urgent cases, by giving nauseating doses of tartarized antimony, or digitalis. Several of these remedies, however, are generally employed rather on account of the particular state and situation of the inflammation, than the degree of fever. Bleeding, for instance, is hardly ever necessary on account of the fever itself; consequently, it is not usual to pursue this practice with the view of altering the state of the pulse, except where the local inflammation is dangerous by reason of its extent, or situa-

* Hunter on the Blood, &c. p. 322.

tion; and where the increased action of the whole sanguiferous system might seriously exasperate the local mischief. Here, also, we should probably use the lancet, on account of the inflammation, were it possible to have at the same time a fever ever so inconsiderable. In short, if the inflammation does not require bleeding, it is difficult to suppose the evacuation necessary for the fever, which invariably subsides with the local disturbance, or when suppuration comes on. In compound fractures and dislocations, which are often followed by a great deal of local inflammation, and symptomatic fever, venesection is not found to be in general an advantageous practice; for it debilitates too considerably, and is apt to leave the system incapable of bearing the tedious suppuration, which very commonly ensues. Nor is it here necessary even for the relief of the fever itself, the strong actions of which naturally subside of themselves in three or four days, either on the occurrence of suppuration, or the union of the external wound. The constitution then remains in a less reduced state, and better qualified to support itself through the rest of the treatment, than if bleeding had been employed. The secretions are to be promoted, and a gentle diaphoresis in particular ought to be excited. For these purposes, small doses of tartarized antimony are the best medicine. The cure and treatment of this fever are, on the whole, so blended with those of the inflammation, from which it originates, that what has been said in the foregoing chapter, makes it quite superfluous to enlarge the present.



CHAPTER III.

SUPPURATION.

SUPPURATION is that process, by which pus, or the matter of sores and abscesses is formed; and the word *abscess* signifies nothing more than a collection of purulent matter. Like inflammation, suppuration may be either *acute*, or *chronic*; *simple*, or *complicated* with some specific morbid action, the lodgment of extraneous substances, &c. Thus, we see acute suppurations exemplified in common whitlows; in milk-abscesses; and many gun-shot wounds, and compound fractures; while chronic suppurations are illustrated in that frequent and serious form of disease, the lumbar abscess, and in

several of the effects of scrofula. Abscesses of the scrofulous kind afford us also striking instances of what may be called chronic suppurations, complicated with specific morbid action, just as true venereal buboes present us with specimens of acute abscesses, complicated also with specific disease. At present, my observations will be confined to the simple, acute form of suppuration, arising from phlegmonous inflammation.

When, notwithstanding the foregoing treatment, the inflammation is attended with more severe pain, a distressing pulsatory sensation, a much harder tumefaction, and a conical, but softer prominence in its centre, suppuration is likely to ensue. Sometimes this event may from the first be prognosticated; because there are inflammations, which, from their peculiar nature, necessarily terminate in suppuration; as boils and carbuncles, and the inflammation, induced by fevers, occasionally termed *critical*.

When the patient is seized with reiterated shiverings; when the fever and all the symptoms of inflammation suddenly diminish, without any perceptible reason; when the patient experiences a heavy, cold, dull uneasiness, instead of acute pain, in the part affected; when the most elevated point of the tumour appears soft and white, while the rest has its redness increased; and when, at the same time, the surgeon can feel a fluctuation, matter is undoubtedly already formed.

The latter symptoms only occur, when the matter is superficially situated. In other cases, the quick subsidence of all the inflammatory symptoms, the repeated rigors, and the sense of weight and coldness, only afford grounds for suspecting that matter is formed. This suspicion, however, is afterwards strengthened by the patient having nocturnal sweats, with emaciation and other hectic symptoms. Also, an œdematous swelling, which is at first not very extensive, takes place over the situation of the abscess, and afterwards spreads, so as sometimes to extend over a whole limb. These circumstances leave no doubt of there being a deeply-seated collection of matter. A man endued with great nicety of touch, can often feel the undulation of matter, even when deeply lodged.

The exposure of the internal surfaces and structure of the body, continued for a certain time, necessarily occasions suppuration. Here the influence of the air is not the cause; for, were a wound made into a cavity naturally closed, pus would be formed, after a certain time, even in a vacuum. When matter forms in circumscribed cavities without a wound, the

air cannot be suspected as a cause: nor does the air, in emphysematous cases, excite suppuration.

The sympathetic fever attendant on inflammation, has been considered an essential step to suppuration; but with little foundation. Is there not a regular secretion of pus from the most indolent ulcers? Is there not the same process on every blistered surface? In such cases is there not often a total absence of fever?

That dead animal matter cannot be converted into pus, is proved by sloughs of the cellular membrane, tendons, fasciæ, &c. &c. remaining unchanged in abscesses a considerable time, and by dead bone lying unaltered in pus for many months. Whatever diminution of these substances may happen under such circumstances, occurs only on that side which is next to the living solids, and it can be satisfactorily accounted for on the principle of absorption.

The idea, that fermentation contributes to the formation of pus, is quite destitute of foundation. The discharge of pus from secreting surfaces, without any loss of substance; the stationary state of many abscesses; the backwardness of matter to become putrid, while unexposed to the air; sufficiently evince, that no fermenting power is present.

The opinion, that extravasated blood can in time be converted into pus, is equally erroneous.*

When suppuration is about to take place in the cellular substance, or membranes of circumscribed cavities, the vessels are supposed to alter their mode of action, so as to secrete pus. This change happens gradually. Hence, pus and coagulating lymph are often found blended together in the same abscess.

The fact, that pus may be formed without a breach of the solids, or dissolution of parts, seems to have attracted the notice of several eminent men about the middle of the last century, especially Dr. W. Hunter, De Haen,† Quesnay,‡ Peyronie, and Morgagni. It was in the year 1749 or 1750, that Dr. W. Hunter was first struck with this truth, in the dissection of a subject, who had died of empyema; and M. Quesnay inserted in one of the early Memoirs of the French Academy of Surgery, a case which fell under the observation of Peyronie, in which a very copious suppuration of the brain took place: the patient died, and the head was examined, when the proportion of brain wanting was so trivial, compared with

* A complete and masterly refutation of all these hypotheses is contained in Hunter's Treatise on the Blood, &c. p. 417, et seq.

† *Ratio Medendi*, Vindob. 1750.

‡ *Traité de la Suppuration*, Paris, 1749.

the quantity of pus that had been discharged, that it was justly concluded the matter had not been formed from the solids, but from the fluids, of the part.*

The modern doctrine of suppuration is, that the pus is separated from the blood by the inexplicable operation of the secerning arteries, just as ordinary secretion takes place; and that the peculiar mode of action in the arteries, is the reason why pus should be separated from the circulation, rather than coagulating lymph, mucus, &c. It is further believed, that the solids never suffer any dissolution, so as to enter into the composition of pus; and that the deficiency frequently apparent in them arises from absorption. The arteries, in producing pus, a fluid so dissimilar from blood, and of which, at least it is to be considered as a new combination, seem to assume all the power of glandular secretion.

The kind of fluid which is discharged from healing sores, or phlegmonous abscesses, receives the name of *healthy* pus; and, in this state, it has the following properties: it is of a yellowish colour; has little smell; is void of acrimony; of the consistence of cream; and when microscopically examined, exhibits white globules in a transparent fluid. At its first formation, however, no globules are perceptible, but it has the appearance of a transparent, gelatinous fluid, and it is not till about fifteen minutes after it has continued on the surface of the sore, unexposed to the air, that they are distinguishable. The globules swim in a fluid which at first might be supposed to be the serum of the blood; for, like the serum, it is coagulated by heat, though not by the gastric juice of animals. It probably contains a small quantity of coagulating lymph, since it partly coagulates after being secreted. But although the colourless fluid, in which the globules swim, is thus far similar to serum, in other respects, it is different; and, according to the observations of Mr. Hunter, it differs from every other animal secretion, in being coagulable by a solution of the muriate of ammonia.† Dr. G. Pearson found, however, that this test would not answer in the examination of matter expectorated from the lungs. He suspects also, that the globules of pus are composed of the red particles of the blood; an opinion, to which another intelligent physician appears to incline, when he says, that the magnitude of the globules of pus, as ascertained by the most accurate tests, is not sensibly different from that of the corpuscles of the blood,

* Mém. de l'Acad. de Chir. t. 2. p. 163. edit. in 12mo.

† Hunter on the Blood. Inflammation, p. 429.

reduced to a round form by the addition of water, or otherwise; while the globules found in other animal fluids, for instance, in milk, are of totally different dimensions.* The perfection of pus seems to depend upon the large proportion which the globules bear to its other parts. Pus sinks in water, and will not readily unite with it: at least, in the common temperature of the atmosphere, it will not mix with it, but falls to the bottom. The caustic fixed alkalies triturated with pus, combine with it into a soapy fluid: with ammonia, it forms a gelatinous compound. In the voltaic circuit, it coagulates rapidly, and yields a substance very analogous to albumen.†

It has been an object with pathologists to have some certain method of discriminating pus from mucus, two secretions, which in their external appearance greatly resemble each other. According to Dr. C. Darwin, the three following characters of pus are correct: 1. Sulphuric acid dissolves it, and the solution is decomposed by water, which *precipitates* the pus. Sulphuric acid also dissolves mucus; but the addition of water separates it in flakes, which *float upon the surface*. 2. Pus is diffusible through dilute sulphuric acid, and through water and brine; but, mucus is not. 3. Caustic alkalies dissolve both pus and mucus; but, when water is added, a difference is exhibited, the pus becoming separated, but not the mucus. Mr. Brande, however, has not found the last of these criteria accurate; and, (says he,) even supposing all these statements correct, they are of no practical utility; because where pus is mixed with mucus in various proportions, the tests are not sufficiently delicate to distinguish it.

Another test of pus, recommended by Grasmeyer, is the following: triturate the substance to be examined with an equal quantity of warm water, then add to it an equal quantity of a concentrated solution of subcarbonate of potass. If pus be present, a transparent jelly subsides in a few hours, which is not the case where only mucus is present. Mr. Brande repeated these experiments, but the results were by no means satisfactory.‡ Besides these chemical tests, and the general distinction of pus sinking in water, while mucus

* Dr. T. Young, in an Introduction to Medical Literature, p. 548, 8vo. Lond. 1813; and in a Practical and Hist. Treatise on Consumptive Diseases, deduced from original Obs. and collected from authors of all ages, p. 26. 8vo. Lond. 1815.

† Brande, in Lecture on Animal Substances. Vid. Lond. Med. Repository, vol. iv. p. 75.

‡ See Lond. Med. Repository, p. 76.

floats, an optical criterion has been proposed by Dr. T. Young, as a very simple and certain means of ascertaining the nature of matter expectorated from the lungs. He regards the globules as the essential characteristic of pus, and it is from their presence, that the test about to be described is derived, while the colour indicates, that there is no mixture of blood. If we put a small quantity of the substance to be examined between two pieces of plate-glass, and holding it near the eye, look through it at a distant candle, we shall observe the appearance, even in the daytime, of a bright circular corona of colours, of which the candle is the centre ; a red area, surrounded by a circle of green, and this again by another of red; the colours being so much the brighter, as the globules are more numerous and more equable. If the substance be simply mucus, there will be no rings of colours, although sometimes there is a sufficient mixture of heterogeneous particles even in mucus, to cause the appearance of a reddish area just about the candle.*

When pus is pure, it does not readily putrefy ; but in specific diseases, cases of necrosis, &c., it is often mixed with blood, or coagulating lymph, in which circumstance, it has more tendency to putrefy, and become offensive. It always partakes of the nature of the sore which produces it. To the surface secreting it, pus is quite unirritating, though sometimes its qualities are such, that they will greatly irritate any other parts with which it happens to come in contact. Hence, the inutility of wiping the matter so completely off the surface of granulations, as some are wont to do, though it is always highly proper to keep the surrounding skin free from it.

When any disease attacks a suppurating surface, or the constitution, the pus becomes thinner, more transparent, and more disposed to putrefy, and grow offensive. *Sanies* is the term frequently given to it in this degenerated state. Sanies may be very irritating to parts, so as to cause their absorption, but it never has the power of corroding them.

The changes in the appearance of pus, arise more from the indolence and irritability of the parts producing the matter, than from disease. Many specific diseases, in healthy constitutions, produce no alteration in the appearance of the matter. Thus, the matter of gonorrhœa, of the small-pox pustule, and of chicken-pock, seems in each case to be made up of similar parts, consisting of globules floating in a transpa-

* Op. cit.

rent fluid, like the pus of a common sore, the specific properties of these diseases being superadded.*

Flakes of opaque coagulating lymph are frequently observed in the matter of indolent sores, and scrofulous abscesses.

The discharge from irritable ulcers is often thin, being chiefly composed of an irritating aqueous fluid, mixed with blood.

With regard to the uses of suppuration, the secretion of pus upon sores and wounds appears to promote the healing process, by hindering the granulations from becoming dry, which state would be very unfavourable, not only for their requisite growth, but for all the minute processes, which take place in the advancement of cicatrization. Another design, answered by means of suppuration, is the discharge of extraneous substances, bullets, pieces of dead bone, &c. Here also we see the utility of the generally greater disposition to suppuration in superficial, than in deeply-seated parts; for, were a foreign body always to excite an abscess very remotely from the surface, the suppuration would only be an increase of mischief; whereas, when the extraneous substance is near the skin, and suppuration occurs, the abscess bursts, and the irritating body is discharged. From some late experiments, made by Sir Everard Home, it appears, that pus naturally contains a large quantity of carbonic acid gas, which, when the fluid containing the globules is inspissated, diffuses itself, and quickly produces, by the passage of its bubbles, a network of anastomosing tubes or channels, supposed to become afterwards vessels. This is a subject, however, which requires further investigation.†

If there were not some boundary to an abscess, some partition between the pus and the cavities of the cellular substance, the matter would diffuse itself extensively on all sides, like the air in emphysema, or the water in œdema. To prevent this circumstance, we find, that coagulating lymph is deposited immediately around the collection of matter; and, becoming organized, assumes the appearance of a membranous cyst. In abscesses of long standing, the cysts are often of very considerable thickness, while in other collections of matter, that have been sudden in their formation, and have not existed long, the surrounding lymph has scarcely had time to be converted into a vascular membranous cyst. The cysts of all

* Sir E. Home on the Properties of Pus, 8vo. Lond. 1789.

† See Phil. Trans. 1818, p. 180—194.

abscesses are both secreting and absorbing surfaces. When the pus has been completely discharged by a puncture, the cavity soon becomes filled again with the same kind of fluid. Large and palpable collections of matter often disappear entirely, and in a manner only to be explained by the action of the absorbents.

Matter always tends to the surface of the body, making its way through a considerable thickness of parts, in order to arrive there. Even when there is but a delicate membrane between the matter and some internal cavity of the body, the abscess generally bursts externally, though it may have to make its way through a remarkable thickness of substance. Its progress is always aided by the relaxation of the skin situated immediately over the abscess. Here the skin is invariably looser, than when it yields to mere mechanical distention, unless the increase of the abscess be very rapid; and as the matter advances towards the surface, the intervening solid parts are absorbed.

The danger of abscesses depends upon their size, number, situation in vital, or other organs of consequence, or the effect of their pressure in impeding the functions of the heart, brain, respiratory organs, urethra, œsophagus, &c.

TREATMENT OF PHLEGMONOUS ABSCESES.

The generality of phlegmonous abscesses soon burst of themselves, and need not be opened. When punctured unnecessarily or prematurely, fresh inflammation is excited, the pain is increased, the seat of the matter cannot be easily reached, and the cure is seriously retarded. The majority of abscesses which are superficial, or at a distance from parts of importance, may be left to burst of themselves. We may also defer opening such abscesses as are slow in their formation, and surrounded by a good deal of hardness of the contiguous parts.*

Particular cases, however, should be opened as soon as the existence of matter is ascertained. When suppuration takes place in the sheaths of tendons, or beneath fasciæ, which invariably retard the progress of matter to the surface of the body, an early opening ought to be made. When this is not done, the matter spreads to a great extent, separating such ligamentous expansions from the muscles, and the muscles from each other. The necessity of this practice is often de-

* Thomson's Lectures, p. 336. Callisen, t. i. p. 318.

monstrated in whitlows, abscesses under the palmar fasciæ, or the fasciæ of the thigh and fore-arm. Phlegmonous abscesses should not be left to break of themselves, when situated in extremely sensible parts, the distention of which would create intolerable pain. An opening is likewise necessary, when the collection of matter lies in a mass of adipose substance, and only presents itself externally, at a very limited point.* Of this nature are abscesses about the anus. Whenever the matter produces evils, resulting from its pressure upon particular organs, its discharge is urgently indicated; as in abscesses near the urethra and neck of the bladder; near the trachea, or larynx; very close to a bone, or in contact with it, under the periosteum.† The best surgeons, however, do not exactly agree, whether the vicinity of an abscess to certain parts is a proper reason for making an early opening in it. Thus, Professor Thomson, and many others, conceive, that the situation of an abscess near a bone, or a large artery, renders an early opening necessary, because it is feared, that, in the first instance, the matter will cause disease of the bone; in the second, weakness of the parietes of the vessel, and hemorrhage, or aneurism. But, says another eminent author, when suppuration happens near a bone, the periosteum becomes thickened, as it were, for the protection of the part. Besides, pus is neither of a corroding, nor irritating nature. When in opening an abscess, which lies near a bone, this part is found affected with caries, or necrosis, it is because it has been originally affected; and, in this case, the abscess is the effect, and not the cause of the altered state of the bone.‡ On this point, however, it is but fair to state, that the most experienced surgeons, and amongst them Sir A. Cooper, generally consider the nearness of an abscess to a bone a good reason for making an early opening; for though the bone may sometimes be affected as soon as, or even sooner than, the soft parts, and though healthy pus has no corroding quality, yet, in other instances, the bone may really be secondarily affected in consequence of the pressure of the collected matter. As exceptions to this rule, Sir A. Cooper, in his lectures, instances cases, where a fluid exists between the pericranium and bone, unattended with any blush of the skin; but, says he, when such blush is present, an opening must be

* Delpech, *Précis des Maladies réputées Chirurgicales*, t. i. p. 29. 8vo. Paris, 1816. Boyer, *Traité des Maladies Chir.* t. i. p. 60.

† Callisen, t. i. p. 319. Thomson's *Lectures*, p. 337.

‡ Boyer, *Traité des Mal. Chir.* t. i. p. 61, 62, and Widemann de *Necrosi Ossium*.

made, for the matter now formed will not be absorbed, and exfoliation is often unavoidable. With regard to the vicinity of a considerable artery to the abscess, it always happens that when, in cases of suppuration, the cellular substance around the vessel is destroyed, the arterial coats are rather thickened than rendered thinner, and they are afterwards covered with granulations, and blended with the surrounding parts. The truth is, I believe, that, although in open phagedenic ulcerations, arteries sometimes give way, such an event is never caused by the vicinity of a simple abscess. When matter is so situated as to be liable to insinuate itself into the chest, or abdomen, or into the capsular ligaments of joints, it is highly proper to prevent such an extension of mischief, by making a timely opening into the abscess. As Boyer observes, however, the risk of such an evil has been unduly magnified; for, besides the general security arising from that law, by which the matter tends towards the surface of the body, there is a further protection, derived from the thickening of the adjacent portion of the serous membrane, investing the above-mentioned cavities.

Authors describe three principal ways of opening abscesses; viz. with a lancet; caustic; and a seton. In almost all cases, the lancet should be preferred; for, it opens the abscess more quickly than caustic, and with less pain; it occasions no loss of substance, consequently, a smaller cicatrix; and, by its employment, the opening may be made in the most advantageous direction, and of the exact size necessary.

The place, where the puncture ought generally to be made, is where the fluctuation is most perceptible; or where the conical eminence, or, as it is termed, the *pointing* appears; for, in this situation, the integuments are thinnest. It is also desirable, (if practicable with due regard to every thing else,) to make the opening in a depending situation, in order to allow the matter to escape as soon as it is formed. Collections of matter, beneath the fasciæ of the fore-arm and thigh, particularly demand attention to this precept, as they commonly point, where those ligamentous bands are naturally thinnest, not where the matter can most readily escape.

With respect to the size of the opening, the only general direction which can be given, is to make it large enough to let the matter escape with facility. When the pus is of thick consistence; contains flakes of coagulating lymph; or lies under a tendinous expansion; the opening should be larger than in ordinary cases.

A grand object in the treatment of most abscesses, after they have burst, or been opened, is to maintain such an open-

ing, as will prevent any future lodgment of a large quantity of pus. When this indication is fulfilled, the cavity of the abscess soon contracts, and becomes filled up with granulations.

When an abscess bursts spontaneously, the opening is not likely to heal, as long as it communicates with a cavity into which pus is secreted; and, consequently, there is no occasion to take any measures to prevent its closing. But, when a collection of matter is deeply situated, and has been opened by an incision, the wound is very likely to close again, especially, if not in a depending situation. In this case, the surgeon must take care to insinuate a piece of lint between the edges of the puncture, and at every visit, introduce a probe.

When a phlegmonous abscess is extensive, and the skin thin, the opening should be made large, and in a depending situation. But, if the shape and size of the cavity of the abscess should prove impediments to the easy escape of the matter through a single puncture, or incision, one or more additional apertures ought to be practised in such places as seem most advantageous. When, however, a depending opening can be made, others are scarcely ever requisite.

When the collection of matter is extensive and deep-seated, or when the opening has not been practised in the most favourable situation for the escape of the pus, the matter burrows passages for itself, which sometimes reach a long way from the original and main cavity of the abscess. These passages, or sinuses, seriously increase the extent of the disorder, and, often having little tendency to heal, before they are laid open, render the treatment more difficult, and the cure more distant. Their direction, extent, and number, can only be discovered by the probe, and sometimes not without the utmost difficulty. As they take place from the matter not having a ready outlet, of course, the first indication in the treatment of them is to make such an outlet; and, then, if they will not heal spontaneously, or with the aid of pressure, they must be traced with a probe, and fairly laid open to their very terminations, by means of a curved bistoury.

Some abscesses will not heal, though the matter easily finds its way out; and their internal surfaces will not produce granulations, unless a complete exposure of the cavity be made, and fresh inflammation excited. Abscesses about the arms, axillæ, groins, scrotum and labia pudendi, are often so circumstanced. It is true, however, that many of these cases are hindered from getting well by the cavity of the abscess not having an adequate, or a very direct external com-

munication. Whichever of these explanations be most correct, no sooner is it certain that a cure cannot be effected by the milder means of a judicious posture, compression, or the use of a stimulating injection, than it becomes the duty of the surgeon either to enlarge the external opening, or lay the cavity completely open to its bottom.

When from any circumstances, preceding the formation of an abscess, there is reason to suspect the complication of a foreign body, the next indication to that of letting out the matter, is to search gently for the extraneous substance, and if loose, to remove it with the least irritation possible.

It was formerly the custom, after puncturing abscesses, to squeeze and press out every drop of matter, which they contained; a practice, attended with a good deal of pain and irritation, and no material advantage. It is therefore not imitated by the best surgeons of the present day, who generally leave the matter to ooze out of itself under the poultice. The old method of stuffing the cavity of the abscess with lint, or charpie, is also condemned, as occasioning needless pain, and opposing the gradual contraction of the hollow, in which the abscess is lodged.*

When a surgeon prefers to open an abscess with caustic, he generally employs the potassa pura, or this substance mixed with quicklime. The part is first to be covered with a piece of adhesive plaster, which has a portion of it cut out, of the figure and size of the opening intended to be made in the abscess. The usual way of making the eschar is to dip the end of the caustic in water, and rub it on the part, till the skin becomes brown. The active substance is then to be immediately washed off with some wet tow, the plaster removed, and an emollient poultice applied.

This method of opening abscesses is rarely advisable. Indeed, I know of hardly any case in which the practice is decidedly advantageous. It has been fancied, that the method is proper when the abscess consists of a small collection of matter, which has been long in forming, and is surrounded by a good deal of indolent hardness. The caustic, it is supposed, may then have a desirable effect in destroying some of the induration, and exciting the absorbents to remove the rest. It is believed, that the stimulus of the caustic will kindle a fresh and more lively action in the parts: one, that will be very serviceable in the cure. The most intelligent observers find, however, that all indurations proceeding from acute in-

* Boyer, *Traité des Mal. Chir.* t. i. p. 67.

flammation, are more likely to be increased than diminished, by caustic applications; and the plan, therefore, if proper at all, should be chiefly restricted to the preceding imperfect suppurations. It is sometimes adopted in cases of buboes, accompanied with much surrounding induration, partly on the foregoing principles, and partly for the purpose of making a largish, and more permanent opening, than a mere puncture, so as to lessen the chance of the skin healing too fast before the bottom of the cavity is sound, and to remove the hazard of the formation of sinuses.* The method, however, is always painful and severe, and certainly ought not to be indiscriminately nor frequently practised. It is a great objection to it, that it is impossible to prescribe any precise boundary to the action of the caustic, and that, unless the eschar be made sufficiently deep, the lancet must after all be employed. Caustic also invariably produces an ugly scar; a consideration of importance in abscesses about the necks and faces of females; and sometimes the eschar is not detached for nearly a fortnight.

Professor Thomson, who entertains a just aversion to the method of opening abscesses with a seton, notices the circumstances in which the plan is ordinarily recommended. First, in large abscesses, where the skin is healthy, and capable of uniting to the opposite side, or bottom, of the abscess. Secondly, in cases where it is wished to draw off the matter of an abscess slowly. And, thirdly, in cases where it is wished to excite a certain degree of irritation in the cavity of the abscess. The seton has also been supposed to be particularly useful in large deep abscesses into which we wish to prevent the entrance of air.† Now, as Dr. Thomson has not sufficiently exposed the absurdity of setons, and I conceive that the employment of them in the treatment of abscesses, especially those of the phlegmonous kind, is altogether wrong and pernicious, it behooves me to examine the reasons alleged in support of the practice. With respect to the first instance specified, why are we to use a seton *because the skin is healthy and disposed to unite to the subjacent parts*? Is it not as much as to say, a seton, a painful, irritating, extraneous substance, a foreign body, must be drawn across an abscess, *because such abscess is already inclined to heal*?

As for the second instance, in which the slow evacuation of the matter is desired, and given as the reason for a seton, such

* See Pearson's Principles of Surgery, edit. 2. p. 68.

† See Thomson's Lectures, p. 342.

an indication never can occur in acute phlegmonous abscesses, though possibly it may do so in certain large chronic collections, especially *lumbar*, or *psoas* abscesses. After these have been opened, and their contents discharged, a series of alarming febrile symptoms not unfrequently ensues, which has been referred by some to the sudden evacuation of the matter; by some to its absorption; and by others, with more reason, to the inflammation of the extensive cyst of such an abscess, induced by making too free a puncture and leaving it open.* Now, admitting what may be rationally doubted, that suddenly emptying an enormous chronic abscess is worse practice than a gradual evacuation of its contents, cannot the surgeon avoid what is objectionable by making only a small puncture, which is on other accounts judicious, instead of a free incision? A large puncture, besides letting out the matter in the manner apprehended, excites too much irritation, at the same time that it facilitates the entrance of air into the cavity of the abscess, and the consequent putrefaction of whatever remains behind. The air, it is true, does not irritate the cyst; but, it promotes such changes in the pus with which it comes in contact, as render this fluid itself a source of considerable irritation and danger. None of these reflections, however, have any thing to do with acute phlegmonous abscesses, which are of a totally different nature. No dangers arise from their being suddenly emptied, or sufficiently opened to let the matter freely escape; and, of course, the reasons for applying setons to them entirely fail.

The third reason, above specified, viz. the wish to excite irritation in the cavity of an abscess, would, I am convinced, never be urged by the strongest admirer of setons in cases of acute phlegmonous abscesses, where the wisest, most successful, and scientific practice, as universally acknowledged, consists in the use of soothing applications, and the avoidance of every thing irritating. All further comment on this reason is, therefore, superfluous.

A fourth alleged advantage of the seton is its preventing the entrance of air into the cavity of the abscess. But, how are we to suppose, that it can act in this way, while it allows a thick fluid, like pus, to issue? Besides, is the great and certain irritation, which the seton itself causes, to be rated lower, than that unproved, questionable kind of irritation, formerly imputed to the entrance of air into the cavities of the animal body? This doctrine originated, because irritation was

* See Abernethy's Surgical Works, vol. ii. Obs. on Lumbar Abscesses.

often seen following incisions in such cavities. But, as the air in emphysema causes no irritation, and there is reason to suspect, that the same cavities would inflame if opened in a vacuum, the opinion seems entitled to little credit. It was a prejudice of this sort which blinded the eminent Dr. A. Monroe* so completely, as to lead him to impute a man's death to the entrance of air into the pericardium, though a hot poker had been thrust into the chest! I can conceive, however, with Mr. Abernethy, that the admission of air into large chronic abscesses may be hurtful by causing putrefaction of the contained matter. I have never known any evils arise from the effects of the air on phlegmonous abscesses.

The best applications to phlegmonous abscesses are fomentations and poultices. While the skin covering the collection of matter continues entire, they are the best dressings, because they favour its relaxation, and accelerate the progress of the matter to the surface of the body. When the abscess has been opened, or has spontaneously burst, they are the most proper applications; for they promote the continuance of suppuration, without which, granulations cannot be produced to fill up the cavity. As soon as the cavity is nearly filled up, the more simple and superficial the dressings are, the better.

After inflammation has arrived at a certain pitch, cold applications and continued evaporation from the part affected avail nothing; on the contrary, they seem to augment the pain, and they probably do so by preventing the relaxing process of the skin. All the changes of phlegmonous inflammation are quick; if it is to terminate in resolution, it will generally do so in about a week or ten days: if it continues unabated beyond this period, suppuration may be expected, and perseverance in the use of cold astringent lotions only prolongs the disorder, by retarding what cannot be avoided.

When the abscess has completely formed; when it has been opened, or has burst, so as to emit daily a considerable discharge; and when the violence of the surrounding inflammation abates; the patient must be allowed a more generous diet. Animal food, wine, and fermented liquors, may now be given with advantage. When the discharge is so copious as to induce debility, attended with loss of appetite, bark, especially the sulphate of quinine, should be administered. Opium may also be given, either with the view of relieving the aggravated pain that immediately precedes the

* On the *Bursæ Mucosæ*, p. 41. Also Discourses on the Nature and Cure of Wounds, by John Bell, p. 347, edit. 3.

formation of matter, or of procuring sleep. Attention must of course be paid both to the prevention of costiveness, and of diarrhœa. The favourable progress of all considerable abscesses is very materially influenced by letting the patient have the benefit of a pure air, and removing him from a close, or crowded apartment.



CHAPTER IV.

HECTIC FEVER.

HECTIC FEVER is essentially characterized by a frequent weak pulse, flushings in the face, the hands, or the feet, and profuse night sweats or diarrhœa.* The irritation of a local injury upon a healthy constitution produces that disordered state of it, termed the *symptomatic*, or *sympathetic inflammatory* fever. This is the *immediate* consequence of local irritation. The system, fatigued and debilitated by the continuance of a disease, which it cannot subdue, at length loses the power of entering into those strong actions, which characterize the preceding description of fever. However, exhausted as it is, it still sympathizes with the local irritation. The exciting cause, as Dr. Young remarks, is almost always some local disease, and generally a great, if not an incurable one; so that this fever seems to be a feeble and hopeless struggle of a constitution about to be overpowered, without any apparent tendency to the removal of the cause.† *Hectic* fever, contrasted with the sympathetic inflammatory fever, is to be regarded as the *remote* consequence of local injury, or disease.

The constitutional symptoms, which attend the formation of pus, in long-continued, profuse suppurations, or which arise as effects of many obstinate and incurable local diseases, even without any suppuration, are generally comprehended under the name of hectic fever. There are, however, some well-informed surgical writers, who still believe, that hectic fever is in every instance connected, if not with the absorption, at least with the formation of pus.‡ My own observa-

* See a Practical and Historical Treatise on Consumptive Diseases by T. Young, M. D. 8vo. 1815, p. 4.

† Op. cit. p. 10.

‡ Thomson's Lectures on Inflammation, p. 526.

tions do not allow me to entertain such an opinion. How commonly do we see patients suffering considerably from hectic symptoms in cases of white swelling, diseased hip-joints, tuberculated lungs, and curvature of the spine, long before any suppuration has taken place? I should say, that the long-continued irritation of any severe local disease upon the constitution, whether accompanied with suppuration, or not, generally produces hectic symptoms. Dr. T. Young informs us, that, when he was 15 years of age, he had himself severe hectic, and every other symptom, usually attending the formation of pulmonary tubercles, though they never arrived at the period of suppuration. And, in another place, he correctly remarks, there are cases, in which a particular change in the state of the fluids, secreted by diseased parts, seems to bring on hectic symptoms, as when an abscess is opened, and the pus is exposed to the air. But, says he, this state of the fluids is not the only cause of hectic; for it often occurs, not only without an open abscess, but *without any abscess at all*. And, on the other hand, in cancerous cases, where there is a very unhealthy suppuration, with great pain, there is often no material hectic, to the last.* It is true, at the same time, that hectic fever is most commonly preceded by suppuration; but the only reason of this fact probably is, that the greater number of local diseases, which come under the care of the surgeon, are in their advanced stages accompanied with ulceration, or abscesses. We see that certain local diseases, which cannot be called severe, though they secrete for a long time a great deal of purulent matter, do not bring on hectic symptoms. We may keep open an issue for a year, or the urethra may discharge a good deal of pus daily for an immense length of time in tedious cases of gonorrhœa, and yet hectic fever does not arise. Suppuration alone, unless exceedingly profuse, in which circumstance it must always be the effect of a severe form of local disease, is not to be regarded as the essential cause of hectic.

Neither does the hypothesis, which ascribes the cause of this fever to the absorption of pus, appear to have a better foundation. The inside of every abscess is both a secreting and absorbing surface, and by the combined action of the arteries and lymphatics, the matter is incessantly undergoing changes. This is a doctrine which is now professed by every modern pathologist. If then the absorption of pus were a cause of hectic symptoms, they would accompany every ab-

* P. 6. 10. and 53.

cess, without exception. Yet, experience teaches us, that this is far from being the case; and that pus frequently lies in abscesses for a very long time, without the patient becoming hectic. Nay, we observe, that pus, even of the worst quality, may be absorbed without producing a single hectic symptom; for we daily see the matter of phlegmonous abscesses, scrofulous suppurations, and venereal buboes, manifestly and entirely removed by the absorbents, and yet no hectic symptoms are the consequence.

Hectic fever comes on at very different periods after the commencement of any serious local disease. This is probably owing to peculiarities of constitution; or the particular structure and functions of the part, whose disease operates as a cause. The more delicate and feeble the patient naturally is, and the more severe and incurable the local disease, the sooner do the hectic symptoms generally begin, and the more rapid is their progress.

Sometimes the first accessions of this fever are almost imperceptible; a very slight degree of emaciation; a pulse a little quicker than ordinary, with a trivial increase of heat, particularly after meals, being the only early symptoms.* As the fever becomes more established, the symptoms generally run as follows: a frequent small pulse, which quickens towards evening, but is always ten or twenty strokes in a minute faster than in health; a moist skin; pale copious urine, with sediment;† a good deal of debility; the tongue seldom so much furred‡ as in most other fevers, its edges being of a bright red colour, and the papillæ swoln and prominent; a florid, circumscribed suffusion of the cheeks; loss of appetite; sometimes an ejection of all food from the stomach; a great readiness to be thrown into sweats; profuse nocturnal perspirations; frequently a constitutional purging; repeated chills and flushes of heat; derangement of the nervous system; loss of sleep; indigestion; heartburn; flatulence. When, however, the biliary system is undisturbed, the digestive powers are little impaired, and the appetite remains good to the last. In an advanced stage, the hair falls off; and the nails become bent.§

Hectic fever is more or less remittent, but never wholly

* Thomson Op. cit. p. 323.

† According to Dr. T. Young, however, the state of the renal secretion is too various to assist in the distinction of the disease, Op. cit. p. 4.

‡ Where, however, the biliary system is deranged, the tongue is covered with a white coat. (Same author, p. 6.)

§ Dr. T. Young, p. 6. and 9.

intermittent. It is observed, that the frequency of the pulse is generally from 100 to 140 in a minute; seldom falling below 100, even in the time of a remission, and, in some cases, never being under 120: while, in other constitutions, the pulse of health may be so slow, that 90 strokes in a minute would be enough to indicate an exacerbation.*

The principal exacerbations generally occur about five in the afternoon: and, if we are to credit Galen, Vogel, and Wilson, who differ from Cullen on this point, an increase of the febrile symptoms always follows a full meal at any time of the day. The exacerbations, which are mostly preceded by chills, are marked by a sensation of burning heat in the palms of the hands, which become red and mottled, and frequently in the soles of the feet. A circumscribed redness is seen in the cheeks, the colour of which, in persons of a florid and delicate complexion, has also, during the remission, a more abrupt termination than in health. It has not been ascertained by the thermometer whether the temperature of the blood is actually reduced during the chills, which usually precede an exacerbation. Whatever may be the form of the exacerbation in the day time, they are generally succeeded towards the end of the night by copious sweats. When a diarrhoea supervenes in the latter stages of the disease, the sweat generally disappears. The reddish sediment of uric acid in the urine is generally observable after the sweats, and absent during the hot fit, when the secretion is usually pale and limpid.†

Mr. Hunter divides hectic fever into two kinds; viz. one, which arises from the absolute incurability of the local complaint; another, which depends upon a disease that is curable, if the patient's constitution had powers sufficient.‡

TREATMENT OF HECTIC FEVER.

The exciting cause of every disease must be removed, ere a perfect cure can be expected. If copious and long-continued suppuration give rise to that affection of the constitution, denominated hectic fever, how can the febrile disturbance cease, while the discharge of matter continues? If the irritation of a scrofulous joint were to excite hectic fever, we should in vain expect to put an end to the constitutional disorder, un-

* Dr. T. Young, p. 4.

† Op. cit. p. 7—9.

‡ Treatise on the Blood, Inflammation, &c p. 497.

less the local cause were first removed. In short, as Dr. T. Young observes, the radical cure of symptomatic hectic fever can only be attended by remedies calculated to remove the primary disease on which it is dependent.

When the local complaint, connected with the fever, is totally incurable, the diseased part must, if possible, be removed by a manual operation. But, when the local disease presents the prospect of being cured, provided the state of the constitution were improved, the surgeon is to endeavour to accomplish the latter desirable object. Frequently, however, the nicest judgment is requisite to determine, how long it is safe to exert the power of medical surgery against the influence of an obstinate local disease on the constitution; for, although patients in an abject state of weakness, arising from irremediable local disease, have often been restored to health, by a removal of the morbid part, yet many have been suffered to sink so low, that no future treatment could relieve them. Clemency in the practice of surgery does not consist so much in withholding strong and vigorous measures, as in deciding to practise them the very first moment when they are indicated.

When an incurable disease in an extremity is removed by amputation, the hectic fever immediately begins to abate. "I have known," says John Hunter, "a hectic pulse at 120 sink to 90 in a few hours, upon the removal of the hectic cause; I have known persons sleep soundly the first night, without an opiate, who had not slept tolerably for weeks before; I have known cold sweats stop immediately, as well as those called colliquative; I have known a purging stop immediately upon the removal of the hectic cause, and the urine drop its sediment."

But, though a radical cure of hectic can never be effected, unless the primary disease be cured or removed, the severity of this fever may often be palliated, and its progress retarded by appropriate remedies. As weakness is one of the strongest features of hectic fever, blood-letting is never admissible; except, perhaps, in a very few examples, where the disorder is attended with unequivocal marks of inflammation in some vital organ. For the same reason, purging, particularly with the neutral salts, must be avoided.

I am afraid no medicine has the direct power of communicating strength to the human constitution; and, it is more than probable, that bark itself only proves serviceable in cases of hectic fever, by its sometimes improving the appetite, and tone of the digestive organs. While the patient eats and digests well, I believe it is never of any service.

Bark was a medicine that filled the old practitioners with a blind sort of confidence in the worst of cases. They saw dreadful forms of disease, accompanied with hectic symptoms, sometimes get well, while their patients were taking bark; but they forgot the *vis medicatrix naturæ*, whose efficacy often conferred an undeserved reputation on this, as well as on many other articles of the *materia medica*. When first I entered the profession, it was the fashion to prescribe bark to a very great extent. Patients were sometimes literally crammed with it; they were frequently purged, sickened, and weakened by it, instead of being strengthened. Nature, however, occasionally overcame both the disease and the supposed remedy; and the ruling prejudices were confirmed. The best surgeons of the present day use bark much less frequently and copiously, than their predecessors. They sometimes give it in hectic fever, with the view of improving the appetite, but never on the supposition, that it can directly strengthen the patient in proportion to the quantity taken into the stomach. The infusion, decoction, or extract, is to be preferred to the powder, which has often been known to cause distressing sickness and obstinate diarrhœa;* but a still better preparation, now much used, is the sulphate of quinine. Dr. Young looks upon steel as the best tonic, when the hectic symptoms have somewhat abated, and general debility has taken place. It may sometimes be joined with myrrh, bark, and other bitters.†

The patient is much more likely to be strengthened by nourishing food, easy of digestion, than by bark, and it should be taken frequently, and in small quantities at a time. Residing in a pure, salubrious air, is also a matter of great importance. In these cases, wine, gentle cordials, and aromatic draughts, are sometimes useful, especially in relieving the heartburn, and flatulence.

Opium is also a valuable medicine, not only procuring sleep, and alleviating pain, but acting, especially when joined with ipecacuanha, as one of the best remedies for checking the diarrhœa frequently present.

Digitalis has been praised for its beneficial effects in hectic fever; but Professor Thomson, who tried it, did not find this commendation well founded. The frequency of the pulse, says Dr. Young, may indeed often be reduced by it from 120 to 50 strokes in a minute; but it is extremely uncertain in its operation, and frequently violent and unmanageable in its

* Thomson's Lectures on Inflammation, p. 328.

† On Consumptive Diseases, p. 50.

effects ; nor is it either immediately or ultimately beneficial in simple hectic affections.* For checking the nocturnal sweats, diluted sulphuric acid is generally considered the best remedy, when the bowels will bear it.

When the local disease is curable, if the constitution could bear it long enough, or the health were improved, medicine may be availing ; but the utmost which can be expected from it in all other instances, is a temporary palliation of the symptoms. These, however, will recur, and in the end prove fatal, unless the diseased part, and the cause of the febrile disorder, admit of removal by a surgical operation.



CHAPTER V.

MORTIFICATION.

By the term, *mortification*, surgeons always mean the death of a part of the body, or the conversion of such part into a dark-coloured, black, fetid, cold, insensible mass, with which the general nervous and vascular systems no longer have any organic connexion. In the bones, the state, corresponding to mortification of the soft parts, receives the name of *necrosis*.

The entire and unalterable cessation of every action and function in the part is absolutely essential in what is understood by mortification ; for, sensibility and power of motion may be annihilated, and yet the part affected continue to live, as is daily exemplified in cases of paralysis.† Recent observations prove, that the temperature of a palsied limb is diminished ;‡ and so probably is the momentum of the circulation in it ; still, the fluids pursue their usual course ; nutrition and absorption are carried on ; and the parts continue to retain, for an indefinite length of time, an inferior degree of vitality.

One of the properties of living matter consists in the power of resisting putrefaction, which the laws of chemical affinity would otherwise produce ; but, as soon as a part mortifies, this characteristic property is lost ; a spontaneous decomposi-

* P. 49.

† See Boyer's *Traité des Maladies Chir.* tom. i. p. 105. Paris, 1814.

‡ Earle in *Medico-Chir. Trans.* vol. vii. p. 173, &c.

tion begins; different kinds of gas are formed; and the exhalations become fetid, and highly offensive.

Numerous are the examples upon record, where the heat, sensibility, motion, arterial pulsation, &c. have been abolished in parts for several days, but afterwards gradually returned. This affection is as different from mortification as suspended animation is from actual death; and the discrimination of it is of the utmost importance, as otherwise there would be a continual risk of amputating limbs, not altogether past recovery. Such mistakes may be avoided, by observing, that where the limb is only apparently lifeless, the cuticle does not separate as in a case of real mortification, nor does the spontaneous decomposition of the part begin, from which the putrid and intolerable smell, peculiar to the latter disorder, is derived.

The aspect and progress of mortification will be found to vary according to the cause by which it is produced.

The following are the principal causes by which the differences and peculiarities of the several cases are determined.

1. Inflammation attended with violence.
2. Inflammation attended with weakness, whether from a local cause, as certain modifications of structure, or from constitutional causes.
3. Inflammation of a specific or malignant nature, like particular forms of erysipelas, the carbuncle, boil, small-pox pustule, pestilential bubo, &c.
4. Great impairment of the constitution, whether brought on by previous disease, as in drop-sical or scorbutic persons, or by intemperance, or by a gradual decay of the vital powers from old age.
5. Stoppage of the arterial or venous circulation in parts, with or without interruption of the nervous influence in them.
6. Great and severe degrees of mechanical injury from external violence, amounting to, what the French surgeons term, a disorganization of parts.
7. Applications which immediately and chemically destroy the flesh, like high degrees of heat, lightning, and a variety of corroding caustic substances.
8. Sudden exposure to warmth after intense cold.
9. Particular organic diseases of the heart and larger blood-vessels.
10. Certain deleterious kinds of food, such as the ergot or vitiated rye,* or barley

* See Dodard's *Obs. in Journ. des Savans*, 1676; Duhamel in *Mém. de l'Acad. des Sciences*, an. 1748; Langius *Descriptio Morborum ex Esu Clavorum Secalinatorum*; *Phil. Trans.* vol. iv.; Tessier, in *Mém. de la Soc. Royale de Médecine*, t. i. & ii., &c. &c. The accuracy of the statements concerning the deleterious effects of the ergot has been sometimes doubted; and all the evils which are supposed to arise from it, imputed to poverty and starvation. (See Bateman's *Practical Synopsis of Cutaneous Diseases*, p. 135. edit. 3.) But the experiments instituted by Tessier, and certain observations

mixed with the raphanus.* 11. Specific contagion, as exemplified in hospital gangrene.

When mortification arises from external injury, it is uniformly preceded by inflammatory swelling and erythismus; the epidermis is detached, and vesications, containing a bloody serum, are produced; the cutis is softened, and acquires a blackish hue; the cellular substance and other textures are decomposed, so as to occasion not only the emphysema and crepitation, which are perceptible on touching the parts, but the formation of an abundance of fetid exhalations and moisture. Hence, this species of mortification is often named *humid gangrene*. We find, however, in the midst of this putrefactive mass, especially if the disease be not too rapid, some muscles, arteries, and nerves, still in possession of a part of their living powers, and resisting, in a certain degree, the tendency to gangrene. Indeed, it is particularly to the early stage of mortification, while some marks of vitality yet continue, that many authors restrict the term *gangrene*. In it there seems to be a partial, but not a total destruction of the part; the blood still circulates through some of the larger vessels; and the nerves retain a portion of their sensibility. In the language of Galen, gangrene is a mortification, which, strictly speaking, is not actually formed, but forming, being the intermediate stage betwixt the height of inflammation, and the complete death of the part. The latter event receives the technical denomination of *sphacelus*, in which state the parts are generally of a dark brown or black colour, void of all natural heat, circulation, sensibility, &c.; and, in the language of surgery, called *sloughs*. Mortification always spreads more extensively in cellular membrane, than in the skin or muscles; a fact, particularly worthy of recollection, when amputation is to be performed.

Such are the phenomena of that species of mortification which is produced by wounds and other modes of external violence, and which is named by Larrey *traumatic*.†

It is very different from other forms of the disorder, which are sometimes termed *chronic*, or *idiopathic*, and are occasioned by internal causes, severe cold, &c. These last ordi-

made in America, (See Gibson's Institutes of Surgery, vol. i. p. 38.) incline me to believe with Professor Thomson, of Edinburgh, that the ergot, taken in certain quantities, has really a specific effect in producing mortification. See Lectures on Inflammation, p. 547.

* Linnæus, Amœnit. Acad. vol. v.

† De la Gangrène Traumatique, ou déterminée par une cause vulnérante. See Mémoires de Chirurgie Militaire, tom. iii. p. 143.

narily attack the more remote parts of the body, where the vital powers are weakest, as the feet, hands, nose, and ears. The part affected becomes black; but, instead of being swelled, as in traumatic gangrene, it rather shrinks, becomes dry, and sometimes hard; on which account, such mortification has also acquired the name of *dry gangrene*; particularly differing from the former in there being no effusion of fluids.

When any considerable portion of the body mortifies, the whole system generally undergoes a sudden and remarkable depression of all its powers. In such cases, however, as are accompanied with a high degree of inflammation, the disorder is attended in its first stages with inflammatory fever, the strong actions of which usually cease either before or as soon as the parts are in a state of sphacelus; and the alarming disorder of the system, sometimes called sympathetic irritative fever, ensues. The patient's countenance all at once assumes a wild cadaverous look: his stomach is severely disordered, vomiting generally occurs, and the diaphragm being affected with a frequent spasmodic contraction, a loud and troublesome hiccough is produced. The pulse becomes small, rapid, and irregular; the brain, especially in bad examples of traumatic gangrene, is soon affected with coma and delirium; the surface of the body is covered with cold, clammy perspirations; and the patient dies. In other cases, the course of the disease is slower; and the mortification would stop, and life perhaps be saved, if the weakening effects of a diarrhœa could be averted, or the state of the stomach improved.

The hiccough, which I have noticed, is a symptom which deserves particular attention; for it is an effect which is almost constantly excited on the first occurrence of gangrene and sphacelus. In particular, it is a symptom, of which every man of experience has a well founded dread in cases of strangulated hernia, where it is nearly a sure indicator of gangrenous mischief within the hernial sac.*

Besides the two principal varieties of mortification, which receive the names of *humid* and *dry* from the state and appearance of the sphacelated parts, there is a third species of disorder, which is peculiar in being of a contagious nature, and, as Delpech† observes, in being followed by a very rapid and singular mode of decomposition in the mortified parts, of which hardly any vestiges appear. No ordinary sloughs are seen; but, in lieu of them, the surface of the diseased

* See Pott's *Chirurgical Works*, vol. ii. p. 68. edit. 1803.

† *Précis des Maladies réputées Chirurgicales*, t. i. p. 75.

part is covered with a whitish, or ash-coloured viscid matter, which exhibits at particular points specks of blood. This case is now well known amongst surgeons by the name of *hospital gangrene*.

The prognosis in cases of mortification differs according to the nature and inveteracy of the causes of the disorder, and the possibility or impossibility of diminishing or removing them. Much also depends upon the strength, constitution, and age of the patient; the greater or less importance of the part affected; the rapid or slow progress of the disease; and its extent. Great prostration of strength; a low, rapid, faltering pulse; a stomach which can retain neither food nor medicine; and the bowels much disordered with diarrhœa; especially when joined with coma and delirium; are symptoms which leave little or no hope of recovery.

As it is impossible to understand the present subject, without taking a separate view of each different species of mortification, I shall next endeavour to fulfil this task, with as much brevity as is consistent with truth and perspicuity.

1. In the account which has been given of inflammation, mortification, was specified as one of its occasional terminations. This unpleasant occurrence is not, however, a common consequence of phlegmonous, or healthy, inflammation, in a sound constitution; except when the exciting causes have been unusually severe, or protracted in their operation. Thus, in cases of burns, gun-shot injuries, contused lacerated wounds, compound fractures, and other effects of great external violence, some of the flesh is frequently destroyed at once, and must be thrown off in the form of a slough; while other parts of it, not actually killed, are yet so injured, that they are seized with a violent degree of inflammation, which quickly ends in sphacelus. In other instances, as I have said, the inflammation ends in mortification, because the exciting cause continues to operate a long time, as we see exemplified in cases of extravasation of urine in cellular membrane. Here the irritation of the urine immediately gives rise to inflammation; and its lodgment and increase of quantity in the parts, are ordinarily followed by dangerous degrees of local mischief, in which urine, purulent matter, and sloughs, are blended together.

The symptoms of mortification, as originating from intense inflammation, have been already detailed; and I shall, therefore, proceed without delay to the consideration of the treatment. In every species of the disorder there are three important indications to be fulfilled; namely, to stop its progress; to promote the separation of the mortified from the

living parts; and to heal the ulcer resulting from the loss of substance.

1. With respect to the first of these indications, it naturally leads to the important object of ascertaining and removing the original cause of the disorder: I mean that cause which first gave rise to the intense inflammation of the parts, and which, perhaps, may still continue to operate. This is a common principle, which should be observed here, as well as in all other parts of surgery. Sometimes we have it in our power to remove the exciting cause altogether; as, when we let out, by suitable incisions, extravasated urine, and hinder its further effusion by the judicious employment of the catheter; or when we take away extraneous substances, splinters of broken bone, and remove and diminish irritation in a variety of forms. Frequently also sloughing is produced and kept up by the employment of hurtful remedies, and then the change to a better practice is the same thing as removing the cause of the disease in other instances, and has an equally beneficial effect. In general, however, when gangrene arises from intense inflammation, the exciting cause is only momentary: it has already ceased; but the injury which the parts have sustained from it, is of a more lasting nature, and must be followed by a high degree of inflammation, and sloughing to a greater or lesser extent.

There can be no doubt, that the extent of mortification may be considerably influenced by the mode of treatment adopted during its incipient stage, termed gangrene. When the disorder is the effect of inflammation, we are bound to believe, nay, we see, that the living circumference is inflamed in the highest degree. Reason and observation, therefore, seem both to concur with respect to the general propriety of antiphlogistic measures in this state and species of mortification. The plan, however, is to be pursued with moderation and caution. It is right, as long as inflammatory fever and acute local inflammation are co-existent with mortification; but, even under these circumstances, evacuations must not be resorted to with the same freedom and frequency, as in examples of inflammation unaccompanied with mortification. In particular, bleeding is to be ventured upon only in young, robust, plethoric subjects. The necessity of this kind of circumspection depends upon the fact, that, whenever a considerable portion of the body mortifies, the constitution immediately feels the shock in every part of it. There is hardly any interval between the genuine inflammatory fever, in which the action of the sanguiferous system seems to proceed even with preternatural force, and another state of the constitution, in which

the predominating symptoms are prostration of strength, and violent agitation of the whole nervous system. In fact, more or less debility always rapidly supervenes; and if the patient be further lowered by the lancet, purgatives, and too spare a regimen, his condition will be rendered hopeless.

Some years ago, the treatment of gangrene and sphacelus was often conducted upon principles which had little foundation. It was presumed, that cinchona had a specific virtue in stopping and resisting the progress of the disorder. To this medicine, diluted sulphuric acid, or alum, was added, when a general tendency to putrefaction was suspected in the system; or cordials and aromatics, as wine, brandy, musk, ammonia, confectio aromatica, &c. when there was great prostration of strength; and opium, when severe nervous symptoms, and extreme pain were experienced.

This opinion, respecting the specific power of bark in the stoppage of mortification, is rejected by every modern surgeon of judgment and experience; without denying, however, that it is a medicine, which in particular states of the disorder, may be administered with advantage. Even then, the benefit never arises from the specific power, which it was formerly supposed to have, of stopping mortification, but from its being an eligible bitter, by which the tone of the digestive organs may sometimes be improved. It is not long since it was the custom to prescribe it in powder, or substance (as it was termed,) and in as large quantities as the patient could be prevailed upon to swallow. But as soon as it was clearly ascertained that the utility of bark did not really depend upon its specific virtue in stopping the disorder, the plan of cramming patients with it was universally abandoned; and it is now only administered in such moderate and reasonable doses, as are not likely to disorder the stomach and bowels, and defeat the very purpose for which alone it can ever be truly recommended. It is not, however, in the early stage of mortification, combined with acute inflammation, that bark, prescribed in any way, can be of service.

When mortification happens from an external local injury in a sound constitution; when it no longer spreads, and the living margin appears red for a small distance from the line of separation, bark is clearly unnecessary.

Mortification, according to its particular nature, causes, and circumstances, may be attended either with sympathetic inflammatory fever; or with another fever, which is characterized by extreme debility, and is either like typhus, or the disorder sometimes described under the name of *sympathetic irritative fever*.

The first fever takes place when mortification arises from external causes in a healthy constitution. Here bark is usually hurtful. The other state of the system may undoubtedly require it, though, if the fever be what is called sympathetic irritative, and great excitement of the nervous system, delirium, picking of the bedclothes, subsultus tendinum, &c. prevail, anodynes, antispasmodics, blisters, and local treatment, will do a thousand times more real good, if any chances of life still remain, than bark in any dose or formula whatever.

In condemning this medicine, however, for certain states of mortification, I am far from wishing the reader to suppose, that even in the progress of these very identical cases, it may not sometimes become necessary, although not at all indicated at an earlier period. Every experienced surgeon knows, that the natural change of circumstances in the course of numerous diseases, renders the exhibition of some medicines absolutely indispensable, which, had they been given at first, would have had the most pernicious effects. When the inflammation surrounding the sphacelus has abated, the patient is low, the appetite bad, and the kind of fever and state of the chylopoietic viscera are not such as to prohibit bark, it should be administered with aromatic confection, wine, fermented liquors, and a light nutritious diet. The sulphate of quinine should also not be forgotten, as a very convenient preparation, which the stomach and bowels will generally bear well. If delirium occur, camphor or musk ought to be prescribed, and a blister applied to the head. In many of these cases, also, the patients would be carried off by diarrhœa, were not the surgeon particularly attentive to the diet, and prompt in the judicious administration of opium, the *mistura cretæ*, &c. Indeed, with respect to opium, it is one of the most valuable remedies in the generality of cases of mortification, and it should be employed in every stage and form of the complaint, attended either with severe pain, or spasmodic, or nervous symptoms. It ought not to be given merely at night, but every four or six hours, so as to keep the constitution under its influence.

With regard to local applications, in cases of mortification, attended with acute inflammation, experience appears to decide in favour of common emollient linseed poultices and fomentations. Mr. Hunter, however, did not think this practice always right, because warm applications seemed to him calculated to promote the increased action of the vessels supposed to exist in the process of inflammation, and, therefore, says he, "such remedies should be well adjusted to the case."

On the other hand, he conceived, "that cold, when carried too far, debilitates or lessens power, but first lessens action." He concludes, however, with saying, "that the parts should be kept cool, and that all the applications should be cold." He justly condemns stimulants as improper, where the actions are already too violent; but he had seen benefit arise from opium applied to the part.* In general, however, as I have said, the preference is now given to emollient poultices and fomentations.† When the gangrenous part is turned into a darkish, or black, fibrous, insensible mass, it is, indeed, of little consequence what is applied to it, as the living circumference claims almost exclusive attention. Both during the extension of the disorder, and afterwards, when the sphacelation has stopped, a simple linseed poultice, or one containing a proportion of finely powdered, recently burnt charcoal, is as good an application as can be employed. Some surgeons are partial to fermenting poultices, and with these not much fault can be found; for though perhaps no particular good can be strictly imputed to their supposed antiseptic quality, the carbonic acid gas produced by them is not stimulating enough, nor sufficiently in contact with the living flesh, to counteract their good effects as emollient applications.‡ They have always appeared to me better calculated for mortification, unattended with intense inflammation, than for the particular cases which we are here considering. A few additional remarks on the topical treatment of mortified parts, will be presently introduced.

2. The second general indication is to promote the separation of the mortified from the living parts.

Although a slough may be scratched, or cut, without pain or harm to the patient, it cannot be pulled away immediately after its formation, without pain, hemorrhage, and, even a risk of renewing the spreading of mortification. The dead part is yet adherent to the living flesh, and cannot be prudently taken away before the absorbents have removed the particles of matter, which compose the uniting medium. As a late author§ remarks, "the separation of dead from living parts is a vital process, not explicable on physical principles, nor by the laws of dead matter." When it is about to take

* Treatise on the Blood, &c. p. 9.

† See NOTE B.

‡ The following is the formula used at St. Bartholomew's Hospital. *R Farinæ Tritici, Cerevisiæ Spumæ Yest dictæ sing. lbss. Misce et calori modico expone, donec effervescere inceperit.*

§ Thomson's Lectures on Inflammation, p. 383.

place, a red line, varying in breadth in different cases, and said to be produced by the adhesive inflammation, usually appears on the living surface, contiguous to the dead. The adhesive inflammation, in fact, seems to be the means which nature employs for stopping the progress of mortification, and preparing the living surface for the separation which is about to be produced. By it, she fills the cavities of the cellular membrane, with coagulating lymph, assists in closing the extremities of the blood-vessels, and establishes the commencement of those operations, by which granulations are to be formed, and the loss of substance repaired. Soon after the formation of the red line of separation, slight solutions of continuity may generally be seen, beginning at various points, and resembling very minute ulcers, which, uniting together, form a hollow line or chink, which extends all round between the dead and living parts.* This loss of substance, which is at first superficial, generally proceeds more and more deeply, till the separation of the sloughs is entirely effected. In this process, which does not materially differ from that of common ulceration, the absorbent vessels are actively engaged, and it is by them that the particles which form the link between the dead and living flesh are removed. From the moment that the separation commences, a discharge at first of a serous, and afterwards of a puriform appearance, begins to take place from the line of detachment, and it becomes more and more abundant, in proportion as the falling off of the slough exposes the subjacent, raw, granulating surface. In young subjects, and in vigorous constitutions, the separation of the sloughs is accomplished with much more celerity than in the old and feeble. The texture and situation of the parts affected, make also a considerable difference in this respect, and, generally speaking, the harder and less vascular they are, and the more remote from the source of the circulation, the longer they are in throwing off their sloughs.

When a part, or limb, is seized with mortification, the blood coagulates in the large vessels, for some distance from the line which bounds the sphacelation. Hence, the separation of the sloughs is not usually attended with hemorrhage, and the security is generally still further increased by the effects of the adhesive inflammation already described.

The cause of the formation of the coagulum in the vessels, as Mr. Hodgson remarks, is by no means evident, although it is probable, that the condition of a mortified vessel may

* Op. cit. p. 384.

interrupt the passage of the blood through it, and, consequently, a coagulum is formed, extending to the next important collateral branch. It is also the coagulation of the blood in the arteries, near a sphacelated part, which accounts for there being sometimes no hemorrhage of importance, nor any occasion for ligatures, when amputation is performed a little above the line of separation.*

Excepting in cases where amputation of the limb is urgently indicated, the separation of a slough should generally be left as much as possible to nature. All that the surgeon can usefully do is to take away every portion of the slough as soon as it is entirely separated from the living flesh. An opposite line of conduct would often excite unnecessary irritation, pain, hemorrhage, and even a renewal of the spreading of the disorder. It is almost inconceivable what little violence will sometimes bring on the latter evil, nor can we be surprised at it, when we advert to the deranged state of the whole constitution, always resulting from the effects of an extensive mortification. If it be at all practicable to expedite the process by which a slough is thrown off, the good is to be derived rather from general, than from local treatment. I know of no applications which have any particular virtue of this kind, and the more simple they are, the better. In fact, none are better than common linseed poultices, with or without a proportion of powdered charcoal; or, if the surgeon like, he may have recourse to the fermenting cataplasm already specified. Much stress has been laid upon the topical use of antiseptics and tonics. Of the former, various powerful stimulants, like oil of turpentine, camphorated spirit, &c., have been tried; of the latter, bark, in a variety of shapes, has been used for covering the parts affected. As I have repeatedly said, it matters not what is put upon such parts as are actually dead, and, if the surgeon choose, he may lay upon them turpentine, spirituous balsams, camphorated spirit, or any thing else which he may prefer, with a view of checking the fetor and putrefaction of the sloughs. But, it is of high importance, that the living flesh around and underneath a slough, be not injured and irritated by any sort of applications. No one who has sound ideas of the nature of the animal economy, would talk of invigorating the parts with spirits and balsams, in order to avert mortification. Yet, once so prevalent was this doctrine, that it was a frequent practice to

* See Petit's Obs. in *Mémoires de l'Acad. Royale des Sciences*, an. 1732. Thomson's Lectures, p. 552., and Hodgson's *Treatise on the Diseases of Arteries and Veins*, p. 13. 8vo. Lond. 1815.

cut and scarify the parts for the express purpose of letting such applications have free ingress to the subjacent living flesh.

Incisions and scarifications in gangrenous parts can do no good, if they are merely made in the sloughs; and, if they extend through the dead to the living flesh, they are not only likely to effect no rational purpose, but must be productive of pain, hemorrhage, and frequently of fresh sloughing. When, however, a slough is large, and a part of it loose, the cutting away such portion is commendable on the principle of lessening the fetor. Were also such sanies to lodge under a slough, a careful incision through the dead part might be useful in affording an exit to the matter. But the proceeding can never be justifiable, when the living parts are to be at all irritated or wounded.

OF AMPUTATION IN CASES OF MORTIFICATION.

I have remarked, that, in general, it is the best practice, to leave the separation of a slough as much as possible to nature. This observation, however, does not apply to certain cases, in which the sphacelus affects the whole thickness of a limb; for here the surgeon is to seize the right opportunity of performing amputation. It is true, that, even in these examples, if the patients lived long enough, nature would also complete the detachment of the dead parts; the soft parts would first separate down to the bone, the bony connexion itself would afterwards be destroyed by the slow process of exfoliation, and the ulcer finally heal.* But, in general, the patient would not outlive the effects which these tedious changes must have upon his health; and sometimes the extension of the mortification itself would carry him off before they had well commenced. In the most favourable cases, also, the sore would not generally heal so as to leave the extremity of the bone well covered with flesh, and with a cicatrix capable of bearing pressure. Therefore, besides the risks and tediousness of this mode of cure, the production of a sound and serviceable stump commonly renders the operation indispensable.

The exact time when amputation should be done, is a question of the first-rate importance. The rule, generally laid down, is never to perform the operation before the mortification has stopped, and a line of separation appears between the

* See facts on this point in Kirkland's *Enquiry into the Present State of Medical Surgery*, vol. ii. p. 380.; and Sir A. Cooper's *Lecture on Gangrene*, &c.

dead and living parts. This maxim, when followed, in regard to mortification proceeding from internal or constitutional causes, is entitled to every degree of respect, and, were it neglected, the stump would often become gangrenous, and the patient's death only be accelerated.

In a few instances, amputation may even be deferred beyond the period when the sphacelation of the limb has ceased to spread, and the red line on the living edge denotes the commencement of the separation. Such is the case, when the patient is so reduced at this critical moment, that he would be likely to die under the operation. Here, a little delay may sometimes be allowed with advantage; the dead parts will separate from the living down to the bone, and, if the discharge be moderate, the constitution, with the aid of suitable diet and medicines, will soon recover sufficiently from its depressed state, to be capable of bearing the operation with a better chance of success.

Baron Larrey, as I have already mentioned, has applied the term *traumatic* to the species of gangrene which follows wounds and external injuries. In cases of this nature, which expose the life of the patient to danger, he says, "amputation should be performed without awaiting the appearance of the line of separation between the dead and living parts." Here, he observes, "it would be dangerous to defer the operation, because the mortification is readily transmitted from the part primarily affected to the rest of the extremity, and he has seen instances in which it proved fatal, in the short space of six hours." He asserts, that there is no reason to fear the re-appearance of gangrene upon the stump, for, whenever mortification arises from external injury, it can only be propagated by absorption and the continuity of vessels. Therefore, says Larrey, if amputation be performed at a proper place, that is, where the skin preserves its integrity, it will arrest the progress, and prevent the fatal termination of the disease. These observations are accompanied with many interesting cases, which, with others recorded in this country, seem to establish the propriety of the practice beyond dispute.*

When mortification originates from the united effects of external violence and the injury of the main artery of a limb, we are not to be governed by the old rule of waiting for the

* Larrey's Mémoires de Chirurgie Militaire, t. iii. p. 141. Lawrence in Medico-Chir. Trans. vol. vi. p. 184. A. C. Hutchison's Pract. Obs. in Surgery, p. 73, &c.

line of separation, before resorting to amputation. Thus, as Mr. Guthrie has particularly pointed out, when a gun-shot injury of the femoral artery and vein is followed by gangrene, which begins at the extremity of the limb, the surgeon must not defer the operation till the mortification stops; for, if the wounded vessels be in the middle of the thigh, it will extend to the seat of the injury, and destroy the patient before any line of separation is formed. Here amputation should be done as high up as the wound of the vessels, and early, that is to say, as soon as the nature of the case is certain, and before the sphacelation has extended beyond the foot.*

Analogous to the preceding species of gangrene is that sometimes following the application of a ligature to the main artery of a limb for the cure of aneurism, or the suppression of hemorrhage. Here, the mortification also generally commences at the extremity of the limb. Whatever may have been inculcated, with regard to other instances of gangrene, this is a case in which the early performance of amputation at some distance from the dead part has always been recommended.

In many accidental injuries, the operation should be performed without any delay, so that mortification may have no time to begin. Numerous gun-shot wounds of the extremities, badly lacerated and contused wounds, and severe compound fractures, will inevitably be followed by gangrene, and the patient's death, if an imprudent attempt be made to save the part. Here amputation should be done immediately after the accident, the wound of the operation being infinitely less hazardous than an extensive and spreading sphacelus.

3. The third general indication in the treatment of mortification is to heal the ulcer, or, in the event of amputation, the wound, resulting from the loss of substance. But on this topic I need not dwell at present, as the principles, on which this indication is to be fulfilled, are explained in the respective chapters on wounds, ulcers, and amputation.

MORTIFICATION FROM INJURY OF LARGE ARTERIES AND NERVES.

In the arrangement of the arterial system, nature seems as if she had foreseen the danger that would arise from an inter-

* See Guthrie on Gun-shot Wounds of the Extremities, p. 59, &c. 8vo. Lond. 1815.

ruption of the supply of blood, and she has, therefore, so multiplied the reciprocal communications or inosculations, in all the different orders or branches of this system of vessels, that the largest trunks are tied almost daily by the enterprising hand of the modern surgeon, and yet, if there be not other causes concerned, this single one is rarely followed by mortification. She appears, however, not to have extended in an equal degree a similar cautious and provident arrangement to the nerves. The destruction of a principal trunk, in this latter system, is invariably followed by paralysis; and, when this circumstance is coupled with the division or ligature of the principal artery of the same limb or part to which the branches of that nerve are distributed, the chances of mortification are much increased. There are, however, some facts recorded, which prove that the communications of some of the smaller nerves are sufficiently direct to qualify them to become, in point of function, substitutes for each other.

I have said, that the division or ligature of the main artery of a limb and of the principal nerve, together, may occasion mortification. Cases are related, however, in which the consequences were only a paralysis and wasting of the member. But Delpach, in considering this subject, remarks, that he knows of no instances of this kind, where the lower extremity was the part concerned; and, with respect to the arm, which is not supplied by a single nerve, hardly any sort of accident can injure the whole of the brachial plexus; the median being the nerve, which is commonly wounded, or tied, with the artery. He observes, however, that notwithstanding the advantage of several nerves, it has almost always happened, that when the nerve accompanying the axillary artery has been included in a ligature with it, the limb has mortified.*

It is true, that in many of these cases, we are also to take into the account, the share which a large extensive wound of the soft parts, or their contusion, laceration, &c., have in the production of gangrene. We rarely or never see a case, in which the injury simply consists in the division, or ligature, of the main artery, and one of the principal nerves of a limb, unaccompanied either with great additional injury, much weakness from the profuse and sudden hemorrhage, the irritation of a previous operation, the injection of the cellular membrane with blood, or a diseased state of the member, any of which conditions may be such as to have considerable influence in bringing on gangrene. On the whole,

* Précis des Maladies réputées Chirurgicales, t. i. p. 98.

perhaps, we are not yet authorized to infer, that the mere interruption of the circulation through the main artery of a limb, and the simultaneous stoppage of the nervous influence derived from one of the principal nerves of the member, would generally occasion mortification, if there were no other additional violence, nor injury, existing in the part or constitution.* Whatever may be the result of future experiments upon this point, no doubt, I think, can be entertained of the fact, that when the stoppage of the circulation through the main artery of a limb is conjoined with loss of the nervous influence in the same member, there is always a much greater risk of mortification, than if the case were simply an interruption of the flow of blood through the vessel. Indeed, so great is the success which now attends operations on aneurism, that I might perhaps assert, with perfect accuracy, that gangrene never arises solely from the ligature of an arterial trunk, unless the patient be of advanced age; the circulation languid from previous debility; many of the collateral branches destroyed, or injured; or some other important cause co-operate in producing the evil.

When mortification follows the ligature, or division, of a principal artery and nerve, the part is from the first cold, insensible, heavy, benumbed, and motionless; its natural heat is permanently lost; the pulsation of its arteries cannot be felt; the cuticle separates; the skin becomes brown and shrivelled; and fetid exhalations soon leave no doubt of the nature of the mischief. This species of gangrene is usually very extensive, being a sphacelus affecting the whole of the limb. It is somewhat less dangerous when it comes on later, and begins at the extremity of the limb; under which circumstances, its progress is ordinarily slower, and its effects sometimes restricted to a partial destruction of the member.

When once this kind of mortification has arisen, every means which it is in the power of the surgeon to adopt, will

* In company with Mr. George Young, I assisted Mr. Lawrence at an operation, in which he divided, by a circular incision, not only the principal arteries and nerves of the finger, but every fibre of the part, with the exception of the tendons and bone. Yet, contrary to all expectation, the blood still gushed profusely from vessels, which could only receive their supply of blood through the medium of such ramifications as passed through the tendons and bone. It was equally curious, that though the principal arteries and nerves were all fairly divided, and the cut carried entirely round the part, mortification was not the consequence. The operation succeeded in checking the progress of an aneurism by anastomosis, which had increased and become attended with many unpleasant symptoms, notwithstanding the radial and ulnar arteries had both been previously taken up by Mr. Hodgson. Some account of this case is given in *Medico-Chir. Trans.* vol. ix. part i. p. 216.

be found insufficient to stop its progress. Hence, in tying the main artery of a limb, too much care cannot be taken to exclude from the ligature the accompanying nerve. We should also avoid every thing which is likely to obstruct the circulation through the collateral branches and capillary system of vessels. In operations for aneurism, the wound should not be larger, nor deeper than necessary ; all compression should be removed ; and the limb kept moderately warm.

Several eminent surgeons have thought, that the best way of preventing this species of mortification, in aneurismal cases, would be to effect a gradual constriction of the artery, so that the flow of blood through it might partly continue, until the circulation was well established in the branches of the vessel. But, as Delpech judiciously remarks, this plan cannot be kept up long enough to be of much service in promoting the circulation ; and experience has proved, says he, that it is liable to the very great objection of partially destroying the circumference of the artery, without holding its parietes in contact, and of thus occasioning a dangerous, and even fatal hemorrhage.* Besides, as I have already observed, gangrene rarely or never comes on simply from the ligature of the trunk of an artery ; and under favourable circumstances, the inosculations are always sufficient : other causes must, therefore, be concerned. The avoidance, or (if possible) the removal, of these would be a much more important object in the prevention of gangrene, than the dangerous experiment of a gradual and incomplete compression of the arterial trunk.

When the case is decidedly an extensive sphacelus, I believe the only chance of preservation depends upon the immediate performance of amputation, high up ; and, if practicable, above the place where the artery, or the artery and nerve, have either been divided or tied. In certain examples, however, in which the first appearance of mortification does not happen till some days after the injury, when the sloughing occurs at the extremity of the limb, and is slower in its advances, the disorder will sometimes terminate in a partial destruction of the integuments of the hand, or foot, and the limb may be saved. But here the surgeon must be most vigilant : for if, in his anxiety to avoid operating, he give the disease time to extend up the limb, the patient will certainly lose his life.

* *Précis des Maladies réputées Chirurgicales*, t. i. p. 100.

MORTIFICATION FROM PRESSURE.

Somewhat related to the kind of mortification which we have just now described, is that which originates from pressure, whereby the circulation in the smaller vessels, and the nervous influence in the parts, are interrupted. However, the great extent of the capillary system, and the prodigious number of its inosculations, make the circulation in it so free, that it must be a powerful and long-continued pressure to stop this important function. The cause may act either upon a limited point of the external surface of the body, or upon the whole circumference of a limb; and, in both instances, the effect may extend to a greater or lesser depth.* When the constitution is enfeebled, pressure much more readily brings on mortification. Of this, every surgeon of experience must have seen repeated proofs in the mortification which attacks the integuments covering the sacrum, os ilium, trochanter major, and scapulæ, in patients who have been long confined in bed by fevers, injuries of the spine, bad fractures, &c. The constant pressure of such parts of the skin, between the bedding and bony prominences, obstructs the circulation through them at a period when the flow of blood is already languid from general debility. They become soft, lead-coloured, red at the circumference, œdematous, and, at last, black and senseless.† The sloughing commences at the point where the pressure is greatest; thence spreads more or less widely, and terminates in the formation of a foul, ill-conditioned, gangrenous ulcer. Some cases present themselves, in which the skin is so extensively destroyed, that, upon the separation of the slough, the sacrum and neighbouring bones are denuded, and visible at the bottom of the ulcer, the discharge and irritation from which are terrible. Patients sometimes get over severe fevers, bad fractures, &c., and ultimately fall sacrifices to this secondary disease.

With respect to the treatment of this particular case, I need not remind the practitioner, that he should always be apprehensive of this species of sloughing in patients, who are weakened by disease and long confinement, and compelled to lie for several weeks and months in bed. He ought, therefore, to prevent the occurrence, by now and then shifting the posture of the sick; and, especially, he should not forget to exa-

* Précis des Maladies réputées Chirurgicales, t. i. p. 101.

† Richter's Anfangsgr. der Wundarzneykunst, b. i. p. 75.

mine from time to time the state of the parts, most subject to attack. On the first appearance of any redness, or discoloration in them, they may be bathed with the liquor plumbi acetatis dilutus, and then covered with a piece of the emplastrum plumbi, or, what is still better, the emplastrum saponis. The posture should at the same time be so altered, that the parts affected may not be lain upon. The judicious arrangement of small pillows, or cushions, under particular points, will often give the surgeon essential assistance in the accomplishment of this highly important indication. When sloughing and ulceration have actually taken place, some surgeons apply lint, dipped in camphorated spirit, or turpentine; others, carrot, or emollient poultices; others, a solution of opium and common pledgets. This indetermination, respecting what is really the best kind of dressing, sufficiently proves to my mind, that not much is to be expected from the virtues of local applications. Improving and strengthening the constitution; changing the patient's posture; and, above all things, the strictest attention to keeping the parts affected clean, and to the avoidance of whatever is irritating to them; are the great leading principles by which the surgeon should be governed.

The circular compression of limbs by tourniquets and tight bandages, if continued too long, will induce mortification. The smaller the extent of the compression, the greater is the risk; and bandages, which operate equally on every part of a limb, though they may be somewhat tenser, can be borne with greater safety than a narrow band, or ligature, which acts only upon a very confined space. Yet, let it not be imagined, that the danger of immoderate, long-continued compression is entirely obviated by equalizing the pressure, and increasing the extent of the compressed surface. There are few surgeons who have not beheld melancholy proofs of the fatal consequences of tight bandages. The greater skill now generally evinced in equalizing the pressure upon the whole limb, we must admit, has much diminished the number of these unfortunate examples; but they do still sometimes happen. A surgeon, therefore, should never forget, that, frequently when he is applying a roller, the nature of the disease or injury will necessarily be followed by a great deal of swelling, and for this due allowance should be made in first putting on the bandage. For the same reason, the part should be from time to time carefully examined, and if found to be too much constricted, it should be instantly liberated. Compression is only safe, while it gives no uneasiness; and, when it appears to produce pain, the suspicions of the practitioner

ought to be immediately awakened to its dangers. In the practice of surgery it is sometimes proper to wet bandages with cold water, or particular lotions; but, whenever this is done, the fluid makes the bandage shrink so considerably, that, if the change be not guarded against, the constriction produced will often bring on a rapid mortification of the limb, and the death of the patient. Let surgeons also continually bear in mind, that tourniquets are only designed as temporary means of suppressing hemorrhage, and that if their application be long continued, they will surely have the most disastrous consequences.*

The perils of immoderate circular compression of limbs proceed, not only from the obstruction which it causes in the circulation, both through the arteries and veins, but also from the interruption of the nervous influence and action of the absorbents.

With regard to the treatment, the indication in an early stage of the mischief is very simple, viz. to remove the bandage, or tourniquet, and have recourse to fomentations, or applications of a discutient, spirituous quality.

When the disorder has advanced further, and actually amounts to gangrene, the conduct of the surgeon must be regulated by the extent of the mischief. If it be partial, let him, after removing the compression, foment the parts, and vigilantly observe the changes which occur; for it is the nature of this species of mortification, often to spread with incredible rapidity up to the very trunk, and thus in a few hours destroy every possibility of saving either the patient's limb, or his life. Whenever there is reason to apprehend, that the case will be of this serious description, if amputation be delayed, the operation should be adopted as the only possible means of affording the patient any chance of life.

MORTIFICATION FROM DEBILITY, IMPAIRED CONSTITUTION, ADVANCED AGE, AND OSSIFICATION OF ARTERIES.

The next examples of mortification, which I shall notice, are those which probably arise from the combined effects of great general debility, and impaired constitution, advanced age, and, perhaps, an ossification of the arteries. Whether this last occurrence, however, should be received in the list

* Amongst the thousands of cases recorded in proof of this fact, I shall merely refer to one related by a distinguished modern writer, Flajani, *Collezione d'Osservazioni et Riflessioni di Chirurgia*, tomo ii. p. 26. Roma, 1800.

of causes, is not entirely settled. We know that, in elderly subjects, some of these vessels are commonly found in an ossified state, and yet the parts which they supply with blood appear in general to have no tendency to gangrene. This fact is established by observations daily made in every dissecting room, and it is an undeniable proof, that ossification of the arteries cannot alone, and without the occurrence of other causes, produce mortification. As also the species of mortification about to be described, mostly occurs in elderly persons, one must naturally expect to find these vessels sometimes ossified in the limbs affected; which is actually the case. But the coincidence of this state of the vessels with gangrene, is far from justifying the conclusion, that the disorder arises from it as a cause; since, in subjects of the same age, the arteries are often found similarly changed, and yet the parts, which they supply with blood, are not at all disposed to gangrene. At the same time, I am far from denying that ossification of the arteries may not, when joined with other causes, facilitate the access of mortification; because one can hardly suppose such an alteration of structure unconnected with some diminution of the momentum of the circulation through the ossified vessels. The case of mortification, now engaging our attention, is one which differs, as much as any example which can be pointed out, from that which follows common, or any other species of active inflammation. It is peculiar in being often only preceded by a burning pain in the part, which undergoes no swelling, and is sometimes of a pale red, or livid colour. It constantly attacks parts at the greatest distance from the source of the circulation, and hence frequently begins in the toes, and sooner or later passes on to the foot and ankle, and sometimes to a part of the leg. In a few instances, it makes its appearance with little or no pain; but, in most cases, the patient feels great uneasiness through the whole foot and ankle-joint, particularly in the night, even before these parts show any mark of distemper, or any thing else than a small discoloured spot on the end of one of the little toes. If the patient has lately cut his nails, or corns, it is frequently, though very unjustly, set to the account of such operation. It is most frequent in men, and oftener attacks great eaters, than free drinkers. I have never seen it in any patient under forty-five. When once the mortification is fairly established, the constitution sinks with great rapidity. The sympathetic irritative fever generally comes on in its worst form, attended with intolerable restlessness; a small, frequent, irregular pulse; delirium and spasmodic twitches; and many patients die by the time the disorder has extended as high as the ankle.

This case is further remarkable, on account of the inefficacy of bark in its treatment. Pott regarded opium as the best medicine for stopping the extension of the disease;* though his account of its effects in this case have been considered by some others as exaggerated.† Wine, camphor, and sub-carbonate of ammonia, have also obtained repute. The topical applications should be of an emollient, unirritating kind. Amputation scarcely ever succeeds, if done while the mortification is spreading.



CHAPTER VI.

ERYSIPELAS,

Is the name commonly given to a peculiar kind of inflammation of the skin, characterized by a diffused redness and fulness of the part, a burning, or itching pain, and frequently vesications and fever. When touched with the end of the finger, a white spot is left, which immediately turns red again. The skin has a shining appearance, feels as if it were a little thickened, and somewhat less pliable than natural; and whether complete vesications have been formed, or not, the cuticle peels off on the decline of the inflammation. The affection has a tendency to spread extensively and rapidly; coagulating lymph is not freely effused in the cellular membrane as in common inflammations; and when suppuration unfortunately occurs, as it sometimes does, the matter not being bounded by adhesions, diffuses itself, and becomes blended with sloughs under the integuments. According to some writers, erysipelas is distinguished from erythema, by swelling and vesications;‡ but these two symptoms frequently rather depend upon the stage and degree of the complaint, than upon its essential nature; because its beginning is never attended with them. If the terms *erysipelas* and *erysipelalous inflammation*, as applied to the local affection of the skin, could be conveniently

* See Pott's Observations on the Mortification of the Toes and Feet: *Chirurgical Works*, vol. iii. Also, Quesnai's *Traité de la Gangrène*, p. 324, &c. Paris, 1749.

† See Kirkland's *Medical Surgery*, vol. ii. and Gibson's *Institutes of Surgery*, vol. i. p. 31. 8vo. Philadelphia, 1824.

‡ Bateman's *Synopsis of Cutaneous Diseases*, p. 125. ed. 3.

exchanged for *erythema* and *erythematous*, as Dr. Good has suggested, a great deal of confusion in this subject might be avoided; for the word *erysipelas* might then be restricted to the idiopathic fever, which is necessarily followed by this kind of inflammation as a symptom, and the inflammation itself, in this, as well as other examples from different causes, might have the generic name of *erythema*, with an epithet expressive of its particularity. Thus, in erysipelas, it is proposed to call it *erysipelatous erythema*.^{*} Certainly a specific fever, followed by this cutaneous efflorescence merely as one of its symptoms, should not be confounded with other cases, in which no general febrile disturbance of the system precedes the local complaint, which arises from causes of a different kind, and itself consists of several varieties.

Mr. Hunter seems not to have limited his conception of erysipelatous inflammation always to an affection of the integuments, but believed, that though the skin is the part which it mostly attacks, there might be constitutions in which every inflammation, wherever it existed, would be of this kind. Here Mr. Hunter probably meant, that the inflammation, so situated away from the skin, would be chiefly marked by a greater tendency to spread than simple inflammation, and less disposition to effuse coagulating lymph; for many of the other characters of erysipelatous inflammation, noticed in the skin, would be lost in deeper textures. When, also, erysipelas shifts its situation, and moves either to a distant part of the skin, or to an internal organ, (*erysipelas metastaticum*,) as described by medical writers, the possibility of this kind of inflammation taking place in other parts besides the skin, is distinctly implied. At the same time it is admitted, that the skin is the most susceptible of erysipelatous inflammation, which will spread extensively over it without materially affecting, at least in ordinary cases, the subjacent cellular membrane.[†] The margin of erysipelatous inflammation is abrupt, the redness not being imperceptibly lost in the surrounding surface, like that of phlegmonous inflammation. In erysipelas, there is less extravasation than in phlegmon and œdema, and little or no effusion of coagulating lymph. Adhesions, therefore, are seldom formed, by which the spreading of the complaint can be checked, or boundaries set to abscesses when they unfortunately occur. In these cases, indeed, suppuration

* See Dr. Good's Study of Medicine, vol. ii. p. 350, and vol. iii. p. 69. ed. 2. 8vo. Lond. 1825.

† Hunter on the Blood, &c. p. 270.

rarely happens, without being attended with considerable sloughing of the fasciæ, tendons and cellular substance under the skin, which latter part being itself highly organized, frequently escapes, even when the sloughing of other less vascular parts is very considerable.

This kind of suppuration and mortification is principally seen, either in severe cases of *phlegmonous erysipelas*, where the inflammation extends more deeply than common, so as to affect a great deal of the cellular membrane; or else in those forms of the disease, which are attended with typhoid fever, and have been distinguished by the epithets *gangrenous* and *malignant*. Whenever erysipelas falls into this unfavourable state, the surgeon finds air, matter, and sloughs, all blended together under the skin, and, on handling the part, a strange feel is communicated, neither like that of fluctuation, nor that of crepitation.* The discharge also becomes peculiarly offensive; not being genuine pus, but a purulent secretion blended with sloughs and other extraneous matter.

To some cases of this description, the name of *diffuse inflammation in the cellular membrane* has been lately applied: it having appeared to several judicious observers,† that the examples in question should not be regarded as erysipelas. The two diseases, says Dr. Scott, with which this diffuse inflammation of the cellular membrane is most likely to be confounded, after the disease is fully formed, are erysipelas and typhus fever. From the first it is distinguished in all the pure cases, by some evident cause of irritation having been previously applied;‡ by the absence of inflammation of the skin; by the swelling having a peculiar elastic or *boggy* feel; by the disease concentrating itself in the axilla of the affected limb and surrounding parts; and by its universal termination in suppuration. From typhus fever, he says, it is distinguished by the febrile affection being symptomatic of a previously existing local action; by the fever corresponding in intensity to the intensity of the local affection; by the brain being much less implicated, excepting where the disorder

* See Hunter on the Blood, &c. p. 272.

† Dr. Duncan jun., in Edinb. Med. Chir. Trans. vol. i. Dr. David Scott, in Edinb. Med. and Surg. Journ. No. 85.

‡ This circumstance does not distinguish it from erysipelas in general, according to the common acceptance of the word, but only from the idiopathic fever, of which the erysipelatous inflammation of some part of the surface of the body, is a mere symptom. Many other cases are excited by various forms of irritation.

arises from dissection (erythema anatomicum ;*) by its history ; and by its non-contagious character.

Erysipelas, in the sense of an idiopathic fever, giving rise to an erythema, or efflorescence as a symptom, comes on with various degrees of severity. In its mildest form, it is preceded by no particular complaints, or merely by a very slight indisposition, languor, restlessness, loss of appetite, &c. These symptoms are of short duration, and abate as soon as the erythema appears, which increases for a couple of days, then remains unchanged about a similar space of time, and afterwards turns yellowish, and gradually fades away, the cuticle at the same time peeling off. During the whole course of the disorder, the fever is slight, the pulse being sometimes only a little disturbed previously to the appearance of the redness.

In a more severe degree of the disorder, the patient experiences, for a couple of days before the erysipelas breaks out, unusual debility, heaviness in the limbs, headach, loss of appetite, nausea, actual vomiting, oppression about the stomach, &c. After two days (generally on the third) the erythema appears, attended with a general perspiration, and an increase in the secretion of urine, when the fever, and all the other complaints subside. The disease then follows the same course as the first case already described.

In the third and most violent degree of erysipelas, which mostly attacks the face, the patient is affected with severe fever, headach, lethargic drowsiness, a symptom generally very strongly marked, shiverings, vomiting, delirium, &c. These symptoms do not, as in the foregoing examples, subside upon the breaking out of the erythema on the third day ; but continue with undiminished vehemence, until the local disorder itself goes off, which usually happens about the eleventh day, attended with copious evacuations from the skin and kidneys.†

The vesications generally form on the inflamed parts about the third, fourth, or fifth day ; and contain a thin irritating

* So named by Dr. Good (Study of Medicine, vol. ii. p. 363,) who describes, as one of its characters, a deep crimson blush, chiefly over the pectoral muscle, which account corresponds with what I have seen. Instead, therefore, of representing *non-inflammation of the skin* as a distinguishing feature, I conceive that it would be more correct to say, that the skin is less widely inflamed, than in common erysipelas ; and does not so soon exhibit discoloration.

† See Richter's Anfangsgr. der Wundarzneykunst, b. 1. p. 98, 99.

fluid, under which the skin generally heals, but sometimes ulcerates. They gradually burst when scabs are produced.

The causes of erysipelas, in the sense of a fever, characterized by this peculiar inflammation of the skin, are as obscure as those of most other fevers, the origin of which cannot be fairly imputed to contagion, or epidemic circumstances. Why an inflammation of the skin, also unprecedented by such fever, should assume the erysipelatous character, is what cannot always be explained. A deranged state of the bilious secretion, disorder of the digestive organs in general, sudden stoppage of perspiration by cold, and a peculiar condition of the system, induced by these or other circumstances, are all conditions which have been repeatedly suspected as having a great share in determining the character of this inflammation. That there is a great and intimate sympathy between the alimentary canal and the skin, seems, indeed, to be proved by the effects of certain kinds of food in bringing out eruptions, resembling urticaria and roseola;* but I am not aware, that the origin of erysipelas from this cause has ever been clearly proved. It is evident, also, that without some idiosyncrasy, which cannot be defined, none of the foregoing exciting causes would produce erysipelatous inflammation, as it is not in every person, or even the generality of individuals, that such a consequence ensues. The same may be said of every species of external irritation. A suspicion has been entertained, that erysipelas is sometimes propagated by contagion;† but whether the commencement and extension of the disorder amongst patients in certain hospitals, as has been sometimes noticed, might not be better accounted for by the operation of epidemic causes, is a point not altogether decided.

That erysipelas generally depends upon some particular state of the constitution cannot be doubted; and this may account for the greater efficacy of internal remedies, than of topical applications. Persons, who lead intemperate lives, and who, in a state of intoxication, meet with local injuries, often have erysipelatous inflammation; while other subjects, of more regular habits, when they receive similar injuries, experience healthy inflammation. At the same time it must be acknowledged, that erysipelas sometimes arises in constitutions, with which we can find no manifest fault; and females and

* Unwashed muscles. Montegre, in *Gazette de Santé*, Mars 1812. Burrows, in *Lond. Med. Repository*, vol. iii. p. 445., Orfila, *Toxicologie Générale*, t. 2. Rice, Lassus, *Pathol. Chir.* t. 1. p. 10.

† Wells, in *Trans. of a Society for the Improvement of Med. and Chirurg. Knowledge*, vol. ii. art. 17.

children, leading perfectly regular lives, are frequently attacked. The obscurity of this topic has not hitherto been removed by pathologists; and even the doctrine of constitutional causes seems to be shaken by the well-known fact, that it is the common course of the disease to be actually getting well on one side, as fast as it is spreading on another. Perhaps, here, the only mode of reconciling things is to suppose, that parts which have been affected, lose for a time their susceptibility of the complaint.

Erysipelas may be attended with inflammatory, or typhus fever. In the first case, which is often named *phlegmonous*, or *acute erysipelas*, the external inflammation is redder, more prominent, and indurated than usual; the pain shooting and throbbing; the pulse full and hard; and the fever ardent. In the second case, which is sometimes called *malignant*, or *gangrenous erysipelas*, and seems to me to include also the disorder named by some modern writers, *diffuse inflammation in the cellular membrane*, the patient is much debilitated, the redness is lead-coloured, dusky, or bluish, and the fever plainly typhoid.

Most writers describe vesications as one of the essential characters of erysipelas; but this statement is only correct, as applied to the affection of the skin in the idiopathic exanthematous fever, called erysipelas; for many cases which surgeons have to deal with, and which are mostly connected with local irritation, wounds, &c. are not attended with any vesications.*

The *habitual*, or *chronic erysipelas*, often arises as an idiopathic disease, and always in the same place. It is very tedious: but is not generally attended with much fever, or other serious symptoms. Sometimes the disorder is *periodical*, recurring in the same person regularly at certain seasons of the year, especially in the spring and autumn. It principally affects persons of advanced age, or women about the period of life when the menses cease.†

The *oedematous erysipelas*, is another variety which must not be forgotten. Its attack is not so sudden as that of the phlegmonous and bilious erysipelas; nor is the disease at first so severe. It increases gradually, and is attended with a greater degree of swelling, which is more diffused. The pain

* See also Pearson's Principles of Surgery, p. 198. edit. 2.

† Lassus, Pathologie Chir. t. i. p. 9. Richter, Op. cit. p. 102. Pearson, p. 200. Callisen says: "Habituale erysipelas ex infarctu hepatis ortum ducere solet." t. i. p. 219.

is less severe. The fever is accompanied with prostration of strength, and a soft, frequent, and sometimes irregular pulse. The system is not relieved on the appearance of the local affection; on the contrary, the danger increases with the progress of the external disease. The part affected is of a pale red, or yellowish brown colour, and if pressed with the finger, a slight pit remains for a little while. When the face is attacked, it has a bloated appearance; the features can scarcely be discerned; and the eyes are concealed by the swelling of the eye-lids. The vesications are smaller and more numerous than in the acute erysipelas, and, after a few days, change to dark-coloured scabs, much resembling those of the confluent small-pox. The disease, when situated about the head, is accompanied with rigors, vomiting, and often with coma and delirium; frequently proving fatal about the seventh day, or a little later.* It never occurs except in bad constitutions, and subjects guilty of excesses in their mode of living.

With regard to the *prognosis*, cases of idiopathic erysipelas, when properly treated, are generally cured about the eleventh day. Considerable danger may arise, however, when external parts of importance are affected; when the disease shifts its situation, and internal organs, such as the brain and lungs, are disordered; or when the case terminates in suppuration and gangrene, either from bad treatment, peculiarity of constitution, or epidemic causes.† Erysipelas of the face, *cæteris paribus*, is more dangerous than that of any other external situation.‡ The coming on of delirium and coma, subsequently to the eruption, is a threatening circumstance. The *malignant* or *gangrenous erysipelas*, attended with low typhus fever, and the forms of disease named *diffuse inflammation* in the cellular membrane, are always dangerous; and so is the *œdematous erysipelas*, when it occurs as an idiopathic disease, is situated on the head and face,§ and accompanied with disturbance of the intellectual faculties.

Mild cases of the idiopathic fever, characterized by erysipelas, are in general soon relieved by the exhibition of saline, purging, and sudorific medicines. Here, however, only such diaphoretics are allowable as operate without stimulating; like the potassæ nitras joined with small quantities of anti-

* See Pearson's Principles of Surgery, edit. 2. pp. 201, 202.

† Callisen, Syst. Chirurgiæ Hodiernæ, t. i. p. 220.

‡ Callisen, Op. et loco citato. Richter, Anfangsgr. &c. b. i. p. 103.

§ See Bateman's Practical Synopsis of Cutaneous Diseases, p. 128, edit. 3. Pearson's Principles of Surgery, p. 202. edit. 2.

monial powder, or the liquor antim. tart. The patient is to be kept in a warmish, but well ventilated apartment, and strictly upon the antiphlogistic regimen.

In a more severe form of the complaint, in addition to these remedies, venesection is sometimes useful,* especially when the pulse is full, and the face is the part attacked. There is an ancient doctrine, that erysipelas is essentially connected with debility; and hence has arisen a common aversion to bleeding as a means of relief; but the experience of Dr. Duncan, and some other modern practitioners, tends to prove, that the practice may be adopted with as much success in cases of erysipelas, as in those of other kinds of inflammation. The nature of the fever, however, should be considered, as a typhoid state of the system will not admit of loss of blood.

When the tongue is foul, with a bitter taste in the mouth, and inclination to sickness; or when the signs of visceral disorder, and the febrile symptoms, yield little, or not at all, to purgatives; and the alvine evacuations have not a very bad smell and appearance; an emetic should be given. Sometimes, during the use of purgatives, the disorder abates for a little while, and then becomes stationary and tedious; here an emetic generally does immense good. When, notwithstanding the administration of gentle purgatives, the gastric complaints repeatedly return, diluted sulphuric acid may often be exhibited with decided benefit.†

In the treatment of erysipelas, joined with bilious disorder, Desault used to administer, in the first instance, a grain of antimonium tartarizatum, dissolved in a liberal quantity of water. The symptoms are said to have frequently subsided immediately after the effect of this medicine, even though a mere increase of perspiration and urine was occasioned by it. When the case proved more obstinate, the emetic beverage was continued, till the febrile disorder and bitterness in the mouth were removed. The cure was then completed, with a dose, or two, of the mildest purgatives. After a few days, the patient was not restricted to a very low regimen.‡

Bark has been almost as extensively recommended for erysipelas as for mortification. When great weakness prevails, the appetite is bad, and evacuations have been duly practised, it is indeed, a medicine which may often be given with ad-

* See NOTE C.

† Richter, Anfangsgr. &c. b. i. p. 105, 106.

‡ Œuvres Chir. de Desault, par Bichat, tom. ii. p. 588.

vantage, especially the new preparation of it, called the sulphate of quinine. It is also frequently proper, when the disorder, besides being attended with these symptoms, is combined with suppuration, gangrenous mischief, and a profuse discharge. In the *gangrenous erysipelas*, which sometimes afflicts new-born infants, and with which, indeed, they appear to be actually born,* bark is said to be an indispensable remedy.† Bark, however, is no more a specific for erysipelas in general, than it is for mortification. In the *acute* or *phlegmonous* form of the disorder, both this medicine and opium are now considered quite unnecessary;‡ but in *erysipelas œdematodes* and *erraticum*, they may be exhibited after the first three or four days, during which evacuations are the chief means of relief. The diet and regimen must conform to the rest of the treatment; being generally at first low and antiphlogistic, and afterwards of a cordial and strengthening kind. When delirium prevails, camphor may be administered, and a blister applied between the shoulders, or rather to the head itself, unless it happen to be the seat of the erysipelas.

Blisters have been extensively employed in the treatment of erysipelas, especially where the disorder appeared to have undergone a *metastasis* to internal organs. Here, they were of course laid upon the part originally affected, with the view of bringing back the erysipelas to it. This is a practice which is yet not altogether discontinued, many practitioners having full faith in the principles upon which it is founded. Sometimes, in obstinate cases of erysipelas erraticum, affecting only the surface of the body, blisters were laid upon distant parts, with a view of relieving the disorder in the parts actually suffering. Dupuytren sometimes attacks the erysipelas erraticum with blisters; but in a very different way, for he lays them directly upon the erysipelatous part, thus following up the disorder in every situation to which it may remove; and Delpech has frequently seen suppuration, gangrene, &c., prevented in other forms of the complaint, by repeatedly blistering the part affected. According to Professor Gibson, also, blisters are very efficacious.§ Nay, Dupuytren sometimes applies the actual cautery to it, as is alleged, with the

* Sometimes called, therefore, *congenital*.

† See Underwood's Treatise on the Diseases of Children, vol. ii. p. 31. edit. 5. Garthshore and Bromfield's Obs. in Med. Communications, vol. ii. Callisen's Systema Chirurgiæ Hodiernæ, vol. i. p. 223.

‡ See Bateman's Practical Synopsis of Cutaneous Diseases, p. 132. edit. 3.

§ Institutes of Surgery, vol. i. p. 45. 8vo. Philadelphia, 1824.

greatest benefit.* In the cases which have been described by Drs. Duncan and Scott, under the name of diffuse inflammation of the cellular membrane, blisters, and even the application of caustic, have been of great service, as I shall presently have occasion to explain.

According to some surgeons, external applications frequently do harm, and are never of much service; and every thing wet, whether warm or cold, emollient, repellent, or astringent, is generally disapproved of.† With respect to the dry, mealy, or earthy powders, which were preferred by Cullen, we have good authority for pronouncing them always useless, and often injurious, since they are apt to form, with the fluid which exudes from the vesications, hard, irritating crusts. Indeed, very disagreeable and dangerous consequences have ensued from their use.‡ Unctuous substances are generally condemned; but, in America, mercurial ointment, made up without any stimulating ingredients, has been found the best of all local applications.§ Some modern authors|| sanction covering the part with little bags, filled with aromatic herbs, to which camphor is added in a more advanced stage of the disorder. Others prefer rubefacients, and mild, warm cataplasms, composed of the powders of aniseed, fennel, chamomile-flowers, mixed with oatmeal, or linseed meal, and a strong decoction of poppy-heads.¶

When there are vesications, they should be punctured with a needle, and the fluid absorbed with a fine sponge.**

When the fever and local redness have mostly or entirely gone, and merely a pale œdematous swelling remains, camphorated or ammoniacal liniments,†† and the use of a bandage, will remove the remains of the disease; or the part may be covered with a piece of green oil-skin.‡‡ On the same authority, we may, when the pain and burning are violent, lay on the part a piece of flannel, wet with warm milk, or a decoction of elder or chamomile-flowers, or poppy-heads; a kind of practice which is also recommended by another eminent

* *Précis des Mal. Chir.* t. i. p. 54.

† Richter, op. cit. b. i. p. 106. Callisen, *Systema Chirurgiæ* Hod. vol. i. p. 221.

‡ Pearson's *Principles of Surgery*, p. 218. edit. 2. Callisen, op. et loco cit. Bateman, op. cit. p. 133. Richerand, t. i. p. ccvii. edit. 4.

§ See Gibson's *Institutes of Surgery*, vol. i. p. 15. 8vo. Philadelphia, 1821.

|| Richter, Callisen, &c.

¶ Pearson, p. 219.

** Richter, b. 1. p. 107.

†† Pearson, p. 219.

‡‡ Richter, p. 107.

writer,* as the best means of preventing any ill consequences from the acrid discharge of the broken vesications.

Both in the *phlegmonous* and *bilious* erysipelas, arising from internal causes, Desault made use of no topical applications, and left the part exposed as much as possible to the air. But, when the erysipelas, whether phlegmonous or bilious, was the consequence of a contusion, wound, or ulcer, he deemed regimen and internal means insufficient, unless assisted by such applications as were best calculated to allay local irritation, and promote suppuration in the sore or wound. With these principles, he employed poultices, the beneficial effects of which are said to have been fully confirmed in his extensive practice. He considered it an essential precaution, however, not to let the poultice extend much beyond the contused place, or the margin of the wound, or ulcer; and over the rest of the erysipelatous surface, if he applied any thing, it was the liquor plumbi acetatis dilutus, ℥j to a pint of water. Even refrigerants may be safely applied to erysipelas arising from external causes.†

As for the local treatment of the idiopathic forms of the disorder, I confess, that I entertain no opinion of the real merit either of rubefacients or stimulating poultices; and join Richter, Willan, and Bateman, in giving a preference, when the redness and heat are very great, to fomentations and tepid bathing, or else to a lotion consisting of the diluted liquor ammoniæ acetatis.‡§

In the phlegmonous erysipelas, attended with risk of gangrene, the making of several incisions in the part is said to have averted this unpleasant consequence.¶ But, when suppuration and gangrene have occurred, the treatment must be regulated by the principles laid down in the foregoing chapters. In particular, early and free incisions are here absolutely necessary, in order to prevent the extension of the mischief under the skin, and to enable the surgeon to draw out the sloughs of tendons, fasciæ, cellular membrane, &c., as soon as they are completely loose.¶¶

* Willan.

† Richerand, Nosogr. Chir. t. i. p. ccvii. edit. 4.

‡ Practical Synopsis of Cutaneous Diseases, p. 134. edit. 3.

§ See NOTE D.

¶ A. C. Hutchison in Medico. Chir. Trans. vol. v. p. 278, &c.

¶¶ {In the erratic form of this disease, when it does not yield readily to the common measures, the alterative plan of treatment is necessary, as small doses of mercury, with the use of antimony, sarsaparilla, &c., followed occasionally by laxatives. The exhibition of the Fowler's solution of arsenic, in these cases, is often attended with great benefit. In the bilious and

I shall conclude this chapter, with a summary of the treatment that has been found to answer best in the cases described by modern writers, under the name of *diffuse inflammation of the cellular membrane*. When the complaint arose from irritation, the patients possessed moderate strength, and only the extremity was affected; the means used, were generally blood-letting in the beginning, sometimes repeated; leeches; cold applications; and a purgative of Epsom salts and tartarized antimony. When the disorder had reached the arm-pit, the depleting system was relinquished, and hot fomentations and poultices applied. When the complaint had much tendency to spread, blisters and caustic potassa were applied, with the view of exciting inflammation in the skin, so as to limit the diffusive character of the disease, by producing an effusion of coagulable lymph. Then poultices were used again, and the parts opened, as soon as possible, with a lancet, even although matter had not yet been formed, as the effusion of even serum was serviceable.

When there was great irritability, tincture of opium, joined with antimonial or ipecacuanha wine, was administered,

phlegmonous erysipelas of this country, a strict antiphlogistic plan of treatment is necessary, and in addition to emetics, cathartics, sudorifics, &c. mercurial remedies are required, particularly in the bilious form, to restore the regular action of the biliary and digestive organs. In the phlegmonous form, the pulse, though apparently depressed, will rise under the use of the lancet, which should be used freely, except in enfeebled constitutions, when more caution is required. Among the local remedies, fomentations of chamomile flowers, stramonium, watery solution of opium with lead water, or even warm water alone, steaming the part over a tub of warm water, often act beneficially. In many cases the simple cold water answers a good purpose. After fomentations, the application of oleaginous poultices, cream, mutton-suet, &c. will in some cases be found soothing. Pressure from bandages will sometimes do good, though we have never seen it carried to the extent recommended by some of the French writers. Rest should be maintained, and posture must be strictly attended to. The part should always be elevated above the dependant posture, and if necessary, splints or other supports should be used, to confine the motions of the joints and limbs. The mercurial ointment and a dilute solution of corrosive sublimate in water have been highly extolled in this country. They often, however, increase the inflammation, especially when resorted to before the reduction of the general excitement. Blisters, also, notwithstanding the great authorities in their favour, often do immense injury; we have repeatedly seen mortification of the skin induced by them. As a general rule, blisters should not be applied over the inflamed part until after the inflammatory action has been greatly reduced by antiphlogistic remedies. There are only two good indications for the use of them in any case of erysipelas; one to check the progress of an extending inflammation, and the other to recall action to the surface after the cutaneous capillaries have lost their energy. To answer both of these purposes, many good practitioners prefer to apply the blisters just above or adjacent to the affected portion of the integuments, and this method has certainly the advantage of avoiding all danger of mortification. }

with a cooling but nutritious diet. When suppuration had taken place, the antimonials were discontinued, and wine and porter allowed. In the cases arising from dissection, every thing that tends to maintain a vigorous circulation of the blood, is found most successful.*



CHAPTER VII.

OF THE FURUNCULUS, OR BOIL.

THE boil is a circumscribed, very prominent, hard, dark-red, painful, inflammatory swelling, of a conical shape, having its base below the skin, and its apex above it. The colour of it is a dusky-red, inclining to purple, and on its summit is a whitish little eschar, under which is a mass of destroyed cellular membrane, called a *core*. A boil is seldom larger than a pigeon's egg, and for the most part single; but sometimes a great number of similar tumors show themselves at once in different parts of the body, or come out in succession, more particularly in children, or just after the termination of an acute disease.† Boils are rarely attended with fever, except when they affect very tender parts, or are large and numerous. Under these circumstances, they sometimes cause in delicate children, restlessness, loss of appetite, and even convulsions, &c. In certain instances, as Heister remarks, the whole body is so miserably infested with them, that the patient can hardly tell how to stir, or on what part to lie.‡ The particular form of inflammation attending boils, and which Scarpa observes might be called *furuncular*, differs in several respects from common phlegmonous inflammation. The former commences in the skin, extends itself downwards into the subjacent cellular membrane, and produces a more or less extensive destruction of it. Phlegmonous inflammation, on the other hand, originates in the cellular membrane, the vitality of which it does not destroy, and is afterwards propagated externally to the skin. The furuncular inflammation is quickly arrested, and forms a small, cir-

* See Dr. Scott's Obs. in Edinb. Med. Journ. No. 85.

† Pearson's Principles of Surgery, p. 72. edit. 2.

‡ General System of Surgery, p. 213. edit. 6.

cumscribed, hard, and very painful tumor, which, though elevated upon the skin, does not contain extravasated coagulable lymph, but consists entirely of mortified or disorganized cellular membrane; while, on the contrary, phlegmonous inflammation is disposed to spread far through the cellular membrane, into the cells of which a considerable quantity of coagulable lymph is incessantly poured, occasioning the tumefaction. In consequence of the furunculus being completely filled with mortified or disorganized cellular membrane, suppuration in it is very imperfect, and never takes place in the centre of the tumor, but only at its circumference, where it is in contact with the sound parts; while, in phlegmon, a true and complete suppuration is formed precisely in the centre of the inflamed part, which, after the discharge of the matter, spontaneously recovers its natural state and functions. In the second stage of the furunculus, the skin, which covers it, ulcerates, and bursts at one or more points, and discharges a very small quantity of serous fluid; and the portion of mortified cellular membrane, which composes the body and base of the tumor, then comes away in the form of an extraneous substance, and the cavity which remains, closes and soon heals.*

Boils mostly arise from a particular state of the constitution, and depend upon internal causes. Hence, the complaint is most frequent in the spring months, and in children, and young persons of full plethoric habits. It is also very often noticed in that state of the system, which immediately follows the recovery from certain febrile diseases, the measles, small-pox, &c. The common circumstance of many boils being formed either simultaneously, or in succession, in the same patient, is another fact tending to prove the agency of internal causes, of which, if there were yet any doubt, it would be dispelled by the consideration, that in some instances, evident marks of constitutional indisposition, for two or three days, precede the local disease. Boils of the latter description were thought by the old surgeons to be critical. Boils, which form in children at the breast, are alleged to proceed very frequently from the bad quality of the milk; and, the instances, in which they are numerous, and disposed to return, are said often to be caused by a disordered state of the digestive organs. I know nothing of the accuracy of

* Scarpa on the Principal Diseases of the Eyes. p. 58, transl. by Briggs, edit. 2.

the common notion, that a boil commences in one of the small glands of the skin.*

As every attempt to resolve swellings of this kind by bleeding, evacuations, and discutient applications, mostly fails, and the longer it is continued the more protracted the disease is, the best general practice is to promote suppuration. It seems, indeed, to be the nature of a boil not only to suppurate, but to destroy a portion of the cellular membrane; and in a few rare examples, in which the surgeon, by means of particular applications, succeeds in bringing about resolution, it is very incomplete, the inflammation alone being removed, and an induration left, which produces more or less inconvenience, from time to time inflames again, and is never totally dispersed, until a free suppuration is excited.†

In all ordinary cases, emollient poultices are the right applications, to which, if the pain be very severe, some of the *extractum conii*, *hyoseyami*, *vel opii*, may be added. In some excellent works on surgery, we are directed to continue the use of poultices, until the tumor spontaneously bursts. But, as the generality of boils are slow in breaking, and the patient never gets relief, until the matter is discharged, the most judicious practice is to make an early and rather a free opening with a lancet. The contents should then be gently pressed out, and every portion of the gangrenous cellular membrane, nucleus, or core, extracted, if it can be done without giving too much pain. When boils are left to burst of themselves, the duration of the disease is generally considerably longer, than when they are opened; and chiefly for two reasons: first, as already observed, because the spontaneous aperture is slow in forming; and, secondly, because when formed, it is not large enough for the ready evacuation of the sloughs, and flakes of dead cellular membrane, contained in the swelling. The presence of the mortified cellular membrane is now known to be one of the principal impediments to cicatrization, and the wisest practice must therefore be, to make such an opening, as will facilitate as much as possible the discharge, or removal of that noxious substance. When this has been done, the employment of emollient poultices, and simple dressings, a few days longer, will generally complete the cure. Many surgical writers recommend the application of escharotics, and particularly the *pulv. hydrargyri*

* Richter, Callisen, &c.

† Richter's *Anfangsgr. der Wundarzn.* b. i. p. 133. Also Scarpa, *op. cit.* p. 60.

nitrico-oxydi, with a view of promoting the separation of the slough, and dispersing the remaining hardness. This, however, is a painful practice, which is no more necessary here, than it is in other abscesses, the hardness around which always subsides in proportion as the inflammation abates; and, with respect to the portion of gangrenous cellular membrane, it will not in general be considerable, nor its detention in the part long, if the surgeon follow the above rule of making a proper and an early opening. Boils always present a very prominent, conical apex, while their base is, comparatively speaking, broad.* The knowledge of this fact must at once convince us of the insufficiency of a small aperture, whether formed by art, or nature.

In severe and obstinate cases, internal remedies, adapted to the particular complications of the disease, are not to be omitted, such as bleeding, aperient medicines, emetics, and a proper regimen. Where several boils occur in a patient advanced in years, bark is said to prove useful; and in children at the breast, the mother, or nurse, should take some purging medicine, and be put on a strict regimen. The infants should also take small doses of antimony with an absorbent powder.† If these plans fail, the milk must be changed.‡ The disposition to boils may sometimes be removed by the use of bark, sea-bathing, acids, steel-medicines,§ and mineral waters.|| When boils are very large, and attended with severe pain, opium should be administered.



CHAPTER VIII.

OF THE ANTHRAX, OR CARBUNCLE.

A CARBUNCLE is an inflammatory, broad, flat, firm, distinctly circumscribed, very painful swelling, of a dark-red or dull-brown colour, somewhat resembling a boil, but larger, and, like it, containing a portion of gangrenous cellular membrane. It begins in the skin, almost like a pimple, and goes

* See Pearson's Principles of Surgery, p. 70, edit. 2.

† Heister, General System of Surgery, p. 214.

‡ See Callisen's Syst. Chir. Hodiernæ, vol. i. p. 328.

§ Pearson, p. 76.

|| Heister, p. 215.

more and more deeply, spreading with a broad base in the subcutaneous cellular membrane.* It is certainly more like an aggravated description of boil, than any other tumor with which it can be compared, though it differs not only in being larger, but also in not presenting so conical a protuberance; the chief part of the swelling lying deep, and none of it being much elevated above the level of the skin. While boils seldom exceed a pigeon's egg in size, a carbuncle is sometimes as broad as a common dinner-plate, as I once saw an instance of in a poor woman, who was, in 1808, a patient in St. Bartholomew's Hospital. This magnitude, however, is only seen in very severe cases, and the average diameter of the tumor, though greater than that of boils, will admit of no such comparison. Sometimes the superincumbent skin, besides being discoloured in the manner above described, becomes so remarkably hardened and thickened, that it feels like brawn. The disease in fact is always attended with extraordinary pain and induration, and the patient is generally much afflicted with a sensation of burning, and stiffness in the part. The dark-red or dull-brown colour of the skin is for the most part chiefly seen upon the centre of the swelling, though, in some instances, the pain and discoloration extend far around. As the disease advances, one or more livid or darkish vesicles, filled with an irritating sanies, form upon its surface; a certain mark of the subjacent gangrenous mischief. On the apex of the swelling, a dark livid spot, bounded by an inflammatory circle, next makes its appearance, followed by the formation of one or several small inadequate apertures, through which a yellow, greenish, bloody, highly fetid discharge flows out, while the great mass of matter, and sloughy cellular membrane, still remains confined. As in the boil, the greatest degree of sloughing in all carbuncles is at their deepest part, or base, which occupies a much wider space than the more superficial portion of the tumor. In many cases, indeed, the deeply-seated gangrene is extensive, even when the unaltered state of the superincumbent integuments causes little suspicion of the mischief. By slow degrees, all the sloughs composing as it were the nucleus of the carbuncle, are discharged, leaving a deep ulcer, at the bottom of which one may sometimes see the exposed muscles and tendons.

Carbuncles seem mostly to arise from internal causes, being most common in persons who have lived well, and rare

* Hunter on the Blood, &c. Part II. Chap. iv.

in subjects under the middle age ;* a point, in which this disease particularly differs from boils. Great prostration of strength, violent headachs, sickness, loathing of food, and a variety of low febrile symptoms, are the common forerunners and companions of the local disorder, and, in bad cases, syncope, extreme anxiety, restlessness, and delirium. The anthrax is well known to be among the symptoms of the plague, and, in this country, it is often attended with severe illness, not unlike the worst sort of typhus fever.

The milder forms of anthrax, where the swelling is not very large, nor the general indisposition at all dangerous, sometimes receive the appellation of *simple* or *benign*. When circumstances are the reverse of this state, and, more especially, when the fever is of bad type, the carbuncle is termed *malignant*. In this case, the swelling exhibits a darker colour, and the surrounding œdema of the skin is more considerable. The carbuncle of the plague is called *symptomatic* or *pestilential*. To these varieties we have lastly to add another, which is endemial in some of the southern provinces of France, which does not arise like all the preceding, from internal causes, but from the application of a specific contagion, resembling, on its first attack, a flea-bite, but afterwards putting on an alarming character, and being well known on the continent under the name of the *malignant pustule*.† While other kinds of carbuncle may present themselves to the number of two, three, or more, in the same patient, the malignant pustule is almost invariably single. In all other cases, some fever or indisposition always precedes the tumor; but, in the malignant pustule, the local disease at first exists by itself, and the low, febrile, typhoid symptoms follow. On its first appearance, it resembles a flea-bite, causing a painful itching, and changing into a small serous vesicle, which is about as large as a millet seed, and quickly turns livid or brownish. In the substance of the integuments, a circumscribed flat tubercle is next perceived, of the size of a lentil; this becomes gangrenous, and is converted into a hard black slough, which is bounded by a reddish, shining, violet, vesicular areola. Considerable swelling follows, and the skin has a glossy appearance. If the pustule be on the finger or hand, the swelling reaches high up the arm, even to the armpit; and, if the disease be in the neck or face, the tumefac-

* Hunter on the Blood, &c. Chap. iv.

† See Methode de traiter les Morsures des Animaux Enragés, &c. suivie d'un Précis sur la Pustule Maligne, par MM. Enaux et Chaussier. Dijon, 1785.

tion spreads over the shoulder. The progress is sometimes alarmingly rapid, the pulse is weak and faltering, and the utmost prostration of strength observable; the patient often dying in the course of two or three days, and the body putrefying with extraordinary rapidity.

That common carbuncles originate, or, at least, are essentially connected with an idiosyncrasy, or some peculiar state of the general health, is a fact of which no doubt can be entertained; but, in what that peculiarity consists, medical writers have not yet been able to specify. This disease is seldom met with in hospitals, because the individuals, in whom it presents itself, are generally persons, whose constitutions have been impaired by excesses at table. It is also seldom noticed in persons below the middle age; but mostly in elderly, debilitated subjects. The cause of the pestilential carbuncle, as its name implies, is the plague. The malignant pustule, if the accounts of its origin be correct, is a very singular and peculiar disease; for, instead of proceeding from internal causes, like all other carbuncles, it arises from a contagion derived from animals affected with malignant fever, or carbuncular diseases. The infection is represented as being communicated to the human subject by contact, respiration, deglutition, or the bites of insects. Slaughtermen, tanners, fellmongers, tallow-melters, and other workmen whose business it is to clean and comb out wool, are said to be particularly liable to the disease. Notwithstanding the multiplicity of authorities in support of this account, some doubts may be rationally entertained respecting its accuracy, when it is remembered that the alleged causes exist in this country, yet we have no disease which exactly corresponds to the malignant pustule. The French writers also specify want, poverty, uncleanness, marshy situations, and the autumnal season, as predisposing causes. Were all these circumstances, however, of themselves adequate to the production of the disease, it would certainly be seen, in some parts of this kingdom. There must, therefore, be other things which contribute to its production, and render it endemial in the southern provinces of France.

In all cases of carbuncle, the prognosis depends very much on the size and situation of the swelling; on the number of such tumors; and, above all, on the state of the constitution. If together with a carbuncle of considerable magnitude, we remark great prostration of strength, a small, rapid, irregular pulse, syncope, frequent vomiting, delirium, &c. the danger is urgent.

When, in the beginning of the disease, a good deal of in-

flammatory fever prevails, moderate venesection, mild saline or calomel purges, and the antiphlogistic regimen, are indicated. But as the change from strength to weakness is often extremely sudden, the lancet should be employed with caution, and few patients will bear the loss of much blood with advantage. Indeed, the antiphlogistic plan can seldom be continued beyond the first two or three days, after which the typhoid state of the constitution comes on, and tonics are strongly indicated.

Where there is reason to suppose the origin of a carbuncle to be connected with disorder of the digestive organs,* nothing is more useful, prior to the accession of much debility, than the exhibition of an emetic, followed by aperient medicines,† such as a few doses of the hydrargyri submurias, or some cooling febrifuge drink, containing a sufficient quantity of the antimonium tartarizatum to keep the bowels well open. In this case, however, as in all other examples of anthrax, so great is the tendency to sudden prostration of strength, and typhoid symptoms, that a tonic plan must immediately follow the means here recommended. In particular, bark, the sulphate of quinine, sulphuric ether, and light nutritious food, are the remedies which produce most benefit.

As the pain of carbuncles is severe, opium is another remedy which can seldom be dispensed with; and it is frequently a good plan to prescribe it in repeated doses, so as to keep the patient under its influence.

In very bad cases, attended with delirium, the head should be shaved and blistered, and, with the other medicines, camphor should be combined.

On the necessity of letting the patient enjoy the benefit of plenty of fresh air, in every instance of a typhoid kind, it is scarcely requisite to insist: it is a measure fully as important as the choice of medicines, and in some respects more so, as without it all the articles of the materia medica will be ineffectual.

In the local treatment, the surgeon should be impressed with the inutility of endeavouring to resolve a carbuncle by any cold or astringent applications, a method, which (to say the best of it) is only loss of time. The most judicious practice is always to have recourse at once to emollient poultices and fomentations.

* See NOTE E.

† See Richter's *Anfangsgr. der Wundarzn.* b. 1. p. 138. Lassus, *Pathologie Chir.* t. i. p. 41.

The openings which form in the tumor are sometimes numerous, but so small that the matter and sloughs cannot readily escape. As they are likewise slow in forming, as well as inadequate to give a free outlet to the contents of the tumor, the best practice is to make an early and free incision. The surgeon should then press out as much of the matter and gangrenous cellular membrane as he can, without causing too much pain. An emollient poultice is now to be applied; the rest of the sloughs gradually loosen; the discharge improves in quality; the surrounding induration diminishes; the ulcer becomes cleaner and granulates; and the cavity is at length filled up and healed. In other less fortunate examples, however, the patient's constitution sinks; no healthy changes occur; and death soon follows.*

The ancients† made it a rule to apply the actual cautery to carbuncles in general; and this method is still pursued in France. Our brethren abroad adopt the old notion, that the heated iron stops the progress of the gangrene, and produces a salutary irritation, which invigorates the debilitated parts. They also occasionally employ the strongest caustics, such as the muriate of antimony; sulphuric acid; the muriatic acid, &c. A bit of charpie is dipped in them, and laid upon the centre of the swelling; or a small puncture is first made, and the caustic liquid then introduced with a pointed piece of wood.

In America, the treatment with caustic also has advocates. "When openings form, and discharge a bloody serum, (says Professor Gibson,) the poultice should be laid aside, and the surface of the tumor, as far as the openings extend, covered freely with the caustic vegetable alkali. The caustic gives some pain, but this soon subsides, and the severe burning pain, peculiar to the disease, is from that time entirely removed. Dr. Physick, to whom we are chiefly indebted for our knowledge of the proper application of this remedy, states, that in all the cases, in which he has used the caustic in this manner, the suffering of the patient ceased as soon as the pain from the caustic subsided. It should be recollected then, that the caustic will prove hurtful in the commencement of carbuncle, but extremely beneficial in the second stage, or that period when openings form in the tumor. From inattention to these circumstances, (continues Professor Gibson,) there is reason to believe much mischief has resulted,—from deep

* See NOTE F.

† A. Corn. Celsus, lib. 5. cap. 28.

ill-timed incisions, from the actual cautery, and from caustics.”

Blisters have been greatly praised for their good effects in carbuncular diseases;* but the latter writer, who has made trial of them, only admits that they are useful in lessening the pain.†



CHAPTER IX.

ŒDEMA.

ŒDEMA is a preternatural accumulation of an aqueous fluid in the interstices of the cellular substance of a part. It is the same sort of disease, as anasarca, only less both in degree and extent.

The tumor is uncircumscribed. The skin of the swollen part retains its natural colour: if at all changed it is rather paler. The part has a cold feel, and the pressure of the finger occasions an impression, or *pitting*, which remains some time, and slowly disappears. There is no acute pain; but an uneasiness, or sense of weight, and tightness. When the œdematous limb is in a depending posture, the magnitude of the tumor is increased; *et vice versâ*.

In a few rare cases, the tumor is quite circumscribed, and of remarkably small extent: Mr. Pott mentions his having seen an affection of this kind, entirely confined to one side of the skin of the scrotum. This is to be wondered at, as the fluid is situated in the common cellular substance.

Sometimes, œdema is conjoined with erysipelatos, or phlegmonous inflammation; the case which Mr. Hunter called *œdematous inflammation*, and which is attended with an extravasation of water, and the appearance of common inflammation, the skin having a scarlet colour, which, however, is more diffused. The effused fluid being principally serum, the swelling is even more diffused than the inflammation itself. The part affected is very painful; but is not attended with much of the throbbing sensation which accompanies common phlegmonous inflammation. The affection seems only super-

* Dorsey's Elements, vol. i. p. 25.

† Institutes, &c. vol. i. p. 51.

ficial, though it probably extends to some depth. According to Hunter, the difference between this and common inflammation, arises from the principle of inflammation acting upon a dropsical disposition, which is always weak. A stronger constitution would have produced the adhesive stage of inflammation, from the same cause. He adopted this belief, on account of the common occurrence of exactly this kind of inflammation, from distention in many cases of anasarcaous legs. Œdematous inflammation is more lasting than common inflammation, and seldom suppurates. Should it do so, the cellular substance, in the interstices of parts, is apt to slough, and extensive, uncircumscribed abscesses to occur.*

Œdema may depend on constitutional or on local debility. Contusions, sprains, the long-continued use of splints, bandages, relaxing poultices, and washes, are often local causes of œdema. A part which has undergone acute inflammation, often remains œdematous for some time afterwards. In all these instances, the tone of the vessels being impaired, is the cause of the disease. The complaint is very often owing to some impediment, preventing the return of blood towards the heart. The pressure of the gravid uterus on the iliac veins, often renders the lower extremities œdematous. Aneurisms frequently compress the chief veins of an extremity, and bring on this affection. Œdema must in many instances be a mere symptom of other diseases, which operate as a cause. It accompanies ascites, hydrothorax, deeply-seated abscesses, &c. &c.

The particular cause of œdema, whatever it may be, must be removed, ere a cure can be effected. When this important indication has been fulfilled, the next aim should be to promote the absorption of the extravasated fluid, and re-establish the original tone of the vessels.

The limb should be kept in a horizontal position. Gentle frictions made on the part with flannel; fomenting with a decoction of chamomile flowers containing a little camphorated spirit; the repeated application of cold water from a spring or pump; liniments; electricity; and a moderately tight roller; will tend to quicken the action of the absorbents.

The operation of these means may be promoted by giving internally purgatives, diuretics, and emetics.

If the tumor should not soften under this plan, but become so tense as to occasion pain, inflammation, and the danger of gangrene, the fluid may be discharged by means of small

* Hunter on the Blood, &c. p. 269.

punctures. These, however, are not void of danger ; for all wounds in dropsical constitutions, and parts, easily become gangrenous. The punctures, therefore, should be as small as possible.

It is chiefly, however, in cases of anasarca, or those attended with a general dropsy of the whole body, and an extensive extravasation of water in the cellular substance, that scarifications become necessary, and not for the local swelling, implied by the term œdema.

When the œdematous part is inflamed, every thing irritating should be removed. No bandages should now be employed. The limb should be placed in a horizontal position, and covered with the lot. plumbi acet. Cooling purgatives are to be given, and the antiphlogistic regimen observed. Such inflammation is apt to occasion dangerous sloughing.



CHAPTER X.

BURNS.

THE injuries of the human body from the application of fire, or heated substances, are all comprised under the name of burns ; with this understanding, that when the accident is occasioned by boiling water, or other hot liquids, it is generally called a *scald*. Callisen,* and others, consider a burn to be nothing more than inflammation, with its ordinary consequences, brought on by the action of high degrees of heat upon the texture of the body. With this idea, we must associate another, in order to render the definition accurate ; viz. that in many severe burns, some of the flesh is destroyed instantaneously by the fire, which actually kills, and even decomposes it, without there being any time or opportunity for previous inflammation.

Burns are mostly divided into four species, or rather degrees. In the first, or mildest, there is but a slight redness of the skin, without any swelling or fever, and only a gentle inflammation is excited, which soon subsides. In the second degree, the redness is attended with swelling, the pain is

* *Systema Chirurgiæ Hodiernæ*, t. i. p. 298.

sharp, and, if the burn be of much extent, and the constitution delicate and irritable, the injury gives rise to more or less symptomatic fever. The inflammation is acute, but it commonly terminates in resolution. In the third degree, vesicles arise either suddenly or gradually, containing a limpid or yellowish fluid, and indicating that the burnt or scalded surface has suffered more from the application of the heated or ignited substance, than in either of the preceding examples. The symptomatic fever is also more severe, the pain greater, shiverings and convulsions sometimes occur, and, unless the vesications be few and small, suppuration cannot be avoided. In the fourth, more or less of the burnt part is deprived of its vitality, or is so injured, that after an attack of violent inflammation, the flesh rapidly mortifies. In large or deep burns, attended with this fourth degree of injury, the constitutional symptoms are usually very severe, the pulse is quick, small, and sometimes irregular, and the disposition to shiverings and convulsions great. However, when the burnt surface is at once destroyed, the case is generally less painful, than other instances in which the degree of injury is somewhat less violent.

Thus, the two slighter kinds of burns generally admit of resolution, the third case is followed by suppuration, and the fourth by mortification. The quantity of injury depends upon the intensity and duration of the heat applied, and upon the extent of surface upon which it has acted. As heated fluids part with their caloric in being diffused, scalds are often attended with various degrees of injury at different points.

It has been correctly remarked, that every division of burns must be in many respects arbitrary. The phenomena, which occur in the milder species, present themselves also in the more severe; and, we frequently see in one and the same burn, simple inflammation in one place, suppuration in another, and elsewhere, ulceration, gangrene, and mortification. Probably, it is partly from inattention to this circumstance, that so great a diversity of opinion has prevailed, with regard to the best method of treatment. Nor may it have been duly recollected, that the state of a burn is constantly changing, so that the remedies which are proper in one stage, may become useless and hurtful in another. The peculiarities of constitution also cause striking diversities in the appearance of burns, and in the effects of remedies upon them. Hence, of several burns resembling each other at first, and treated exactly alike, not two will heal precisely in the same manner.*

* See Thomson's Lectures on Inflammation, p. 586.

The danger of burns is proportioned to the extent as well as the violence of the injury; hence, cases of even the fourth kind, not occupying much space, may be insignificant, while others of the first and second descriptions may be dangerous, and, indeed, actually fatal from their large extent. The danger of scalds is often considerable on account of their size; but burns may be attended with great risk, not merely in consequence of their magnitude, but also by reason of the depth to which the parts are injured or destroyed.* The age

* {The constitutional effect is, however, of most consequence, and this is by no means proportioned to the extent and violence of the local effect in all cases. The two first divisions do not, in general, produce constitutional irritation, and are not dangerous. The third division is as likely to be followed by dangerous symptoms as the fourth, especially if the cutis be left exposed and raw. The chief danger has to be encountered in the first few hours, and the superficial vesicating burns produce as severe immediate irritation as the deep ones. The ultimate effects of deep burns are most dangerous on account of the exhausting suppuration and debility; the primary irritation not being more severe than the superficial burn, and often not so severe.

The constitution is affected in various ways by burns. The vital forces are, however, always taken by surprise. They are thrown, therefore, into a state of prostration from which they sometimes are never able to recover. The patient will shriek; shudder; complain of chills and an internal sensation of coldness; become pulseless, comatose, insensible, asthmatic, and then die. This is a fair example of the overwhelming shock, and can only be arrested by the vigorous use of stimuli, both internal and external. If the pain subsides speedily, and the surface grows pale, the patient will almost certainly die.

Mr. Travers says, "the continuance of pain, so as to require the use of opiates, is favourable." "The early subsidence of the complaint, unwillingness to be disturbed, apathy approaching to stupor, as if the scale of sensibility had sunk below the point of pain, is invariably fatal. Continued shivering is an ill omen. The failure of the pulse, and consequent coldness of the extremities, with a livid hue of the lips and cheeks from congestion of the capillaries; drowsiness, with occasional muscular catchings, are sure prognostics of death. The disposition to coma is characteristic, and invariably occurs even if no opium be given. The respiration is light, scarcely audible, until the pulmonary circulation failing from the diminished power of the heart, congestion takes place in the capillaries of the lungs; but this does not happen till long after the same state has pervaded the system. Finally, laborious breathing and stertor ensue, and the patient expires in an apoplectic coma, with or without convulsions." "Inspection demonstrates fulness of the veins of the brain, and its membranes, and effusions beneath the arachnoides, confirming the symptoms of the latter stage."

In the treatment, our first efforts should be to establish a reaction of the system in all cases of prostration. Should it not occur spontaneously, we must resort to stimulants externally and internally; in the more severe cases, having recourse at once to the more powerful stimulants, as hot oil of turpentine, &c. externally; and brandy, with warm gruel, &c. internally.

Care should be taken to regulate our remedies by the degree of prostration, and the power which the system may have for establishing a reaction. We have a wide range of remedies, given by different authors, from the more simple warm diluents, to more powerful internal stimuli,—and from the sim-

and constitution of the patient make a good deal of difference in the chance of recovery; burns in delicate unhealthy subjects, and in young children, being more dangerous, than in strong, healthy, adult subjects. The situation of the burn is another consideration of importance; for burns about the head, throat, chest, and abdomen, generally have worse consequences, than similar injuries of the limbs. Burns of the first and second degrees, unless they occupy a large surface, may be said to be usually free from danger, and by proper treatment, the inflammation may almost always be resolved. In cases of the third degree, suppuration commonly follows, and, if the injury be extensive, there may be a great deal of fever, and considerable danger. Large chronic ulcers are also a frequent consequence. Cases of the fourth degree, *cæteris paribus*, are the most dangerous of all, and never can be cured without a detachment of the dead parts from the living. Burnt patients may die from the violence of the inflammation, from the size and depth of the injury, and the shock of it upon the whole constitution, from the severity of the symptomatic fever, from convulsions, from the profuseness of the discharge, or from the effects of gangrene. Extensive burns of the skin frequently bring on great difficulty of breathing; an effect of which every experienced surgeon is aware.

Severe suppurating burns often produce disfiguring, irregular scars, stiffness and contractions of joints, wryness and distortions of parts, irremediable blindness, specks upon the cornea, concretions of the fingers, toes, or eyelids, a closure of the lachrymal passages, or of other ducts and apertures, eversion of the eyelids, and a variety of other deformities and mutilations.

With respect to the treatment, perhaps, we shall find in no

ple ointments, or those blended with stimulants, to the hot turpentine, &c. externally. When reaction takes place spontaneously, or by the more simple means, it will be well to anticipate considerable constitutional irritation; and should this supervene, the danger will be in proportion to its severity. The symptoms of high febrile action in burns and scalds, will not bear reduction to the same extent as when arising from other causes, and it is only when very high, that interference is advisable; indeed, this excited state of the system is in some degree desirable.

When we have succeeded in establishing reaction in the sinking from extensive burns, by the most energetic remedies, it is of importance to maintain that reaction, at the same time taking care not to carry it too far; and for this purpose, ammonia, in the form of *spts. mindererii*, with a few drops of *laudanum*, may be given with diluent drinks. Should we wish for stronger stimuli, the carb. ammonia, either in pills or emulsion, will be useful; at the same time that wine whey, or gruels flavoured with wine or brandy, may be allowed. }

branch of surgical practice a stronger disposition to prejudice and credulity. A preposterous belief in the possibility of discovering some particular application, calculated for every sort of burn, and (what is more wonderful) for every stage and state of it, has not been one of the least absurdities which have disgraced this part of the healing art. Yet, one would suppose, it requires but little intelligence to discern, that as all burns are not alike, no single plan of treatment can be invariably right. Too often the salutary operation of the *vis medicatrix naturæ* has been mistaken for a sort of proof of the good effects of several inert, or pernicious remedies, and it has not been properly remembered how many burns would get well of themselves; nay, how many do actually undergo a cure, notwithstanding all the difficulties created by bad and unskilful surgery. If, however, a proposition at the beginning of this chapter be correct, viz. that the effects of burns are analogous to those of inflammation in general, inclusive of suppuration and mortification, then the same common principles which guide us in the treatment of inflammation and its consequences, ought undoubtedly to form the rule of our conduct in the treatment of burns. Nor can it be questioned, that these accidents must require as much variety of management, as any other cases, in which are exemplified all the different states and stages of inflammation, ulceration, mortification, &c. It would not be more ridiculous to suppose, that all the numberless varieties of gun-shot wounds, should be left to the efficacy of some favourable plaster or ointment, than to fancy, that burns of every degree and condition, should have only one sort of dressing; or, that if a change be made, this is not to be regulated by the state of the injury, but rather by the time or period of it. Thus, if we follow the advice of some writers, we are to dress all burns the first day with a certain application; the second day with another; and other alterations follow every rise of the sun. But this mechanical and unscientific way of legislating in surgery by the clock or sun-dial, is totally inconsistent with every notion which I can form of right practice. It must be wrong, inasmuch as the state of burns, at fixed periods after their occurrence, must be infinitely various, not only on account of the different degrees of primary injury, but also because the nature of the patient's constitution, his age, strength, weakness, health, &c., constantly have vast influence over the subsequent appearances of the injured part.

In the treatment of superficial burns and scalds, the indications are to remove the inflammation, and, by this means, prevent the formation of blisters; but, if we fail in this pur-

pose, we must endeavour to hinder the vesications from becoming painful and troublesome ulcers. In a preceeding chapter, I have explained the acknowledged efficacy of cold applications in diminishing inflammation, and most of the observations which have been there introduced, might be here repeated. The practice of employing cloth dipt in cold water, or in rose-water, cooled with ice or snow, as dressings for the less severe cases of burns, is as ancient as the time of Rhazes. The plan should be adopted as soon after the accident as possible, it being, as Avicenna has remarked, one of the best ways of preventing the formation of blisters. Another good method, when the situation of the injury will admit of it, is to immerse the scalded or burnt part, in very cold spring or ice water; or else to pour fresh cold water plentifully over the injured surface. Pounded ice,* enclosed in folded linen, or mixed with hog's lard, is another excellent application for scalds and superficial burns, situated on the head, back, and other parts which cannot be conveniently immersed in cold water. It would be endless to enumerate all the different local remedies, which at least in burns unattended with any separation of the cuticle, exposure of the cutis, or ulceration, operate chiefly, if not entirely on the principle of reducing the temperature of the part. Suffice it to mention various spirituous lotions, spirit of wine itself, the lotion of the liquor plumbi acetatis, and the dressings so much in vulgar repute, raw potatoes scraped into a soft pulp. All these applications being colder than the burnt surface upon which they are laid, tend directly to lower its temperature, an effect which they must further produce by their continual evaporation. But, in order to derive the utmost benefit from cold applications, they should be frequently renewed, as they soon become of the same temperature as the parts with which they are in contact.

Although it seems to be generally admitted, that no local remedies are better than such as are cold, for the relief of scalds and superficial burns, there is nearly the same unanimity amongst surgical writers respecting the danger of extending this practice indiscriminately to large or severe injuries of this nature, especially when situated upon the trunk. In extensive burns, however superficial they may be, the patient is liable to be affected with cold shiverings, and these shiverings may be greatly aggravated by exposure, and the

* Essay on the Means of lessening the Effects of Fire on the Human Body, by Sir J. Earle.

application of cold.* Here the liniment of lime-water and linseed oil, and fomentations, will generally be found better, and more agreeable dressings, than refrigerant washes.

In speaking of the treatment of inflammation, I had occasion to notice the curious and seemingly inconsistent facts, of that process being sometimes most benefited by cold, and sometimes by warm applications. We find the same thing exemplified in the milder kinds of burns, and even more; for, if we are to credit a long list of writers, including Aristotle himself, as well as several distinguished moderns, holding the burnt part near the fire immediately after the accident, is an effectual plan of rendering the symptoms milder. This method of *burning the burn*, as the phrase runs, is then not merely a vulgar practice, but a plan sanctioned and seriously commented upon by men of the greatest eminence. Yet, as Professor Thomson justly remarks, the plan, notwithstanding so many authorities in its favour, has never come into general use. The inflammation of superficial burns has a natural tendency to resolution, and, as this happens under the influence of both hot and cold applications, one is almost inclined to believe, that nature, in effecting the cure of most cases of superficial burns, needs but little assistance from art; and that, whatever degree of credit practitioners may take to themselves for the spontaneous results, which occur under different modes of treatment, the cure in reality ought to be ascribed to nature.†

Perhaps we should view in a similar light certain applications, which are said to do good by keeping the burnt surface from the effects of the external air: as, for instance, olive oil, the linseed oil, and lime-water liniment, &c. In those milder burns, where the insensible cuticle is for the most part unbroken, how are we to imagine that the external air could prove so hurtful, even were it possessed of those noxious irritating qualities, which the imaginations of surgical writers, rather than nature, have conferred upon it? If oily liniments, therefore, be really useful in assuaging the effects of superficial burns, (as I believe them to be,) it is better and more philosophical to be content with saying, that experience proves such efficacy, than to venture into fanciful and unfounded explanations of the fact.

Small vesications, if not opened, may subside, but larger blisters should be pricked with the point of a needle, and the

* Thomson's Lectures on Inflammation, p. 591.

† Lectures on Inflammation, p. 592.

fluid let out, without removing the cuticle. In general, every superficial burn of much extent, requires antiphlogistic treatment, venesection, mildly aperient medicines, and other means known to be beneficial in relieving inflammation. Opium is also indispensable in every instance attended with much pain, as it not only diminishes the suffering, and procures sleep, but lessens the disposition to those dangerous convulsions, which carry off a large number of burnt patients. When the injury has been caused by the explosion of gunpowder, the grains are often lodged in the skin, from which they should be delicately removed with the point of a needle.

We come now to the consideration of the mode of treating the third species of burns, or those which suppurate. As Professor Thomson observes, the suppuration in severe cases may take place by the second or third day, but frequently it does not begin till a later period. It often happens without any appearance of ulceration, just as it does from a blistered surface; and, after continuing some time, it is stopped by the formation of a new cuticle. In other instances, small ulcerations appear on the surface, or edges of the burn. These spread into extensive sores. When suppuration takes place, unaccompanied by ulceration, any mild simple dressings will generally heal the part without difficulty. The applications in most repute, are the liniment composed of linseed oil and lime-water; the unguentum zinci; the ceratum plumbi; either of which may generally be employed with advantage, immediately after cold applications cease to produce benefit.

In the other description of suppurating burns, while the injury is in a very painful state, and the ulceration is extending itself, no applications are better than emollient poultices. Afterwards, when this destructive process has stopped, the secretion of good pus begun, and the surface of the ulcer become clean, and covered with healthy granulations, the unguentum zinci, the ceratum plumbi, or common lint, with a pledget of any simple ointment, may be used as dressings. Should the sore require gentle stimulation, a little of the powder of myrrh and lapis calaminaris may be sprinkled upon it, before the other dressings are applied. No ulcers, however, are so disposed as those of burns, to throw out with surprising rapidity, high fungous granulations, over which the cicatrization proceeds with slowness and difficulty, and, when completed, leaves the part deformed with several indurated knobs and inequalities. The grand means of preventing this exuberance of the granulations, formerly consisted in the skilful application of pressure, by means of a roller, and in touching the surface of the ulcer with the nitrate of silver, or dressing

it with unguentum resinæ, with every ounce of which 3j of the pulv. hydrargyri nitrico-oxydi was blended. So freely, indeed, was this mercurial escharotic employed, that patients were frequently salivated by its absorption, and almost daily teased with its irritating operation on the sore. But, the improvements in modern surgery have, in a great measure, superseded the necessity for this practice; for, when the situation of a burn is such as to admit of the part being compressed, and the edges of the ulcer approximated with straps of adhesive plaster, it is found, not only that the granulations keep their proper level, but that cicatrization goes on with much greater expedition. The surgeon should always recollect, however, that this is a method which is as improper for burns, which are in a painful irritable state, with the ulceration spreading, as the use of tight bandages, or of caustic itself, would prove under the same circumstances. So various and multiplied, however, are the conditions and appearances of the sores resulting from burns, that a knowledge of this branch of practice implies that of the right method of treating ulcers in general; a subject to which we shall advert in a future chapter. The concretion of parts is to be prevented by the interposition of lint, the introduction of a probe, tube, bougie, or piece of sponge; and the frequent separation of the surfaces likely to grow together. It is particularly necessary to remember this advice, in burns about the toes, fingers, ears, nostrils, &c. When burns are situated near a large joint, like the knee or elbow, the limb should be chiefly kept in the position in which it would be most useful in the event of an ankylosis taking place. But every possible effort should be made to avert this unpleasant consequence, by gently moving the joint as soon as the state of the burnt part will allow. Should the evil, however, be unavoidable, the future position of the limb is a very important consideration; and, I need hardly observe, that while the lower extremity is most valuable, in the extended or straight posture, the arm, on the contrary, is most serviceable with the elbow bent. The ankylosis, of which I am speaking, is not what is termed true, but arises partly from preternatural adhesions, partly from long inaction of the muscles and tendons, and partly from the absorption of the granulations, after cicatrization, and the subsequent contraction of the skin. The simple division of such shortened portions of the integuments is rarely succeeded by any permanent removal of the wryness, deformity, and immobility of the parts, and after the wound has healed, things generally fall into the old state again. Here the practice sug-

gested by my friend, Mr. Earle,* to cut away the cicatrix, bring the sides of the new wound together in a longitudinal line, and maintain the observance of a better position for a certain time, by means of splints and other mechanical aids, has sometimes materially and permanently lessened the deformity. A modification of the same treatment, introduced by Mr. James, of Exeter, has also proved successful.†

Burns of the latter kind require, from the first, constitutional as well as local treatment; for, when at all extensive, they are always accompanied with a good deal of symptomatic fever, in which the pulse, instead of being strong, full, and hard, as after most other accidental injuries, is generally small, quick, and vibratory. It is this weakness of the pulse which deters practitioners so much from bleeding: a practice, however, which is indispensable in the early stage of severe cases. Perhaps, indeed, the more frequent use of the lancet in this part of surgery, would form a real improvement. As Dr. Thomson observes, in the dry and hot state of the skin, diaphoretics may be used with advantage. Laxatives are often necessary; but, in general, only the gentler sort should be given, on account of the pain which moving always gives to the patient. Here likewise anodynes are frequently necessary, not only to procure sleep, but an alleviation of pain. During the symptomatic fever, a mild, vegetable, farinaceous diet is proper; but afterwards, in the suppurating stages, it is essential to support the patient with animal food, wine, and cordials.‡

With regard to the treatment of the fourth species of burns, or those attended with sloughing, I believe we ought to pursue the same general principles, which should regulate our conduct in the treatment of other causes of mortification. The faith put in the superior efficacy of vinegar, spirit of wine, and the linimentum terebinthinæ, as first dressings for these cases, ought certainly not to be unbounded; and I cannot help thinking with Dr. Thomson, that in the early stage of many of these injuries; that is to say, while the skin is unbroken and free from ulceration, it matters little whether we apply vinegar, spirit of wine, or oil of turpentine. None of these substances then come into contact with any raw, exposed, sensible parts, and, therefore, cannot be supposed to do either much harm, or good, at least, as far as any specific

* Medico-Chir. Trans. vol. v. p. 96. and vol. vii. p. 173, &c.

† Op. cit. vol. xiii.

‡ Lectures on Inflammation, p. 594.

quality is concerned. The evaporation of the vinegar, and spirit of wine, however, will tend to cool the parts, and, on this principle, perhaps may be useful. As for the linimentum terebinthinæ, employed in the manner which Dr. Kentish directs, I entertain exactly the same views of the practice as Professor Thomson of Edinburgh. The turpentine is used only just at first, while it can do no harm; that is to say, while it cannot touch or irritate any raw, or ulcerated surface; and then the applications are gradually altered to a milder description. We may, therefore, see a reason for the success of Dr. Kentish's method, without placing the least confidence either in the visionary theories which he suggests, or in the alleged superior virtue of the oil of turpentine, as a general first dressing for burns. With these reflections, I am induced still to profess myself rather an advocate for simple emollient applications in cases of sloughing burns. Common poultices, the liniment of linsced oil and lime-water, and fomentations, are the means which I prefer until the eschars have separated. The remaining sores should then be treated according to the precepts already hinted at in the present chapter. The constitutional treatment of these cases is precisely similar to that of mortification arising from violent inflammation.



CHAPTER XI.

EFFECTS OF COLD.

OF the general exciting, or stimulant power of heat, as a modern writer observes, there can be no doubt. And, with regard to cold, the disputes, concerning its operation, have been perpetuated only by logical illusion. In common language, we are accustomed to speak of cold as a positive and active energy, while philosophy can acknowledge it only as the expression of a relative decrease of temperature; for any degree of temperature designated by the appellation of cold, is still heat.* The very same temperature may be called hot

* Kellie, in *Edinb. Med. and Surg. Journ.* vol. i. p. 305. The latter part of the above remark may be said to be generally true, with respect to any degree of cold of which we ever speak; though rules for calculating the zero of heat have been given. See *Essays on Subjects chiefly Chemical*, by W. Irvine, M. D.; 8vo. Lond. 1809.

or cold, according as it is compared with a colder or a hotter temperature. If we warm one of our hands at a fire, while we cool the other by means of ice, and then plunge both of them into water of the common temperature of the atmosphere, the water will feel cold to the hand which has been heated, and warm to the other which has been cooled.

In a physical sense, every temperature of the air, or other surrounding medium, below 98° , might be denominated cold, because this is the common heat of the human body ; but with regard to the feelings and the health, a degree much lower, namely, from 60° to 65° , is the most grateful and invigorating. The external medium at the temperature of about 62° appears to abstract the heat of the body in the same proportion in which it is generated, without any extraordinary exertions of the system ; and, therefore, neither contributes to exhaust its powers, nor to excite uneasy sensations. Hence, also, the denominations of temperate, warm, hot, cool, and cold, are given to particular degrees of the thermometric scale. The sensations of different men may vary, however, according to the power which their respective constitutions possess of evolving heat. This depends much upon the original vigour of the system, especially of the heart and arterial system. It is also much influenced by habit, or by a person's being seasoned to the cold. Hence, people who from vigour of constitution, or from habit, readily evolve a considerable quantity of heat, especially during moderate exercise, can bear with pleasure and benefit to their health, the very same degree of cold, which to the weak and unhabituated, is a source of painful chilliness.

The first effects of certain degrees of cold applied to the human body, is to weaken the circulation through the small cutaneous vessels, more especially those which are situated in extreme parts, like the hands and feet ; or, in projecting parts, as the ears, nose, scrotum, &c. which expose a larger surface to the atmosphere, or medium, by which their caloric is abstracted. Hence the skin becomes pale, and contracting round the miliary glands and roots of the hairs, exhibits a roughness which is compared to the skin of an unfeathered goose, and is technically named the *cutis anserina*. The action of the heart and arteries in general becomes weakened ; and the blood, being partially delayed in its course through some of the cutaneous vessels, and not undergoing the change of colour, which a circulation through the lungs produces, it gives a bluish or livid colour to the fingers, ears, and other projecting parts. If the cold be intense, or the exposure long-continued, the circulation in the extreme parts becomes alto-

gether interrupted, and the power of evolving heat being completely destroyed, mortification is the consequence. Parts killed in this manner are said to be *frost-nipped* or *frost-bitten*.

From the languor and weakness of the arterial system, produced by the application of cold, other effects on the constitution necessarily accrue. A free circulation of well-oxygenated blood seems essential to the perfect execution of the functions of the brain and nervous system, and to the support of sensibility. If the circulation is suspended for a few moments, as in syncope, the sensibility is also suspended; and, on the other hand, when there is more than an ordinary supply of blood to any part, as in inflammation, the sensibility is highly augmented. Hence another immediate effect of the agency of cold on the human body, is a diminution of the sensibility of parts. This is universally felt, in the numbness of the hands and fingers, which, under the impression of cold, are altogether incapable of accurate discrimination of touch: and the whole of the surface of the skin partakes of the imperfect feeling. The tongue is also incapable of distinguishing the peculiar flavour of sapid bodies, if they be extremely cold; and the sense of smell is considerably enfeebled by cold. If the cold be intense, or its application long-continued, the powers of the whole system yield; a torpor of the animal functions ensues; the action of the muscles becomes feeble, and scarcely obedient to the will; an unconquerable languor and indisposition to motion succeed; and drowsiness comes on, ending in sleep, from which the person, if not speedily roused, frequently awakes no more.*

The strong propensity to sleep, following the anxiety and lassitude experienced at an earlier period, is noticed by most writers as the precursor of imminent danger;† and it is certainly a symptom of usual occurrence. But, as an intelligent author remarks, it is doubtful how far the state of sleep is the necessary consequence of simple exposure to cold; or, at least, what other circumstances besides cold are necessary for its production, since this exposure may be made to an intense degree of cold for a considerable length of time, without sleep

* See a description of the effects of the cold at Terra del Fuego, on the persons who landed there with Dr. Solander and Sir J. Banks, as detailed in Captain Cook's first voyage.

† Richter, *Anfangsgr. der Wundarzn.* b. 1. p. 117. Larrey, *Mém. de Chir. Mil.* t. iv. p. 106. Callisen, *Syst. Chir. Hod.* pars i. p. 308.

being induced.* The case of Elizabeth Woodcock,† who lay buried under snow more than a week without sleeping a great deal, and those of some shipwrecked sailors, who were more or less immersed in water, in severe weather, for 23 hours, without being seized with drowsiness, are proofs that an irresistible propensity to sleep is not constant.‡

In describing the manner in which the French soldiers perished from the severity of the cold in Russia, Larrey remarks, that their death was preceded by a paleness of the countenance, by a sort of idiotism, difficulty of speech, weakness of sight, and even a total loss of these faculties. In this state, some of the men continued to march for a greater or lesser time, led by their comrades. The action of the muscles gradually grew weaker; the men reeled about as if they were drunk; and their debility increased until they fell down, a certain sign of the total extinction of life. The incessant and rapid march of the troops in close masses, obliged those who could not bear it, to quit the centre to walk along the side of the road. Separated from this compact column, and left to themselves, they soon lost their equilibrium, and fell into the ditches of snow, from which it was hardly possible for them to get out. Here they were immediately seized with a painful numbness, followed by lethargic drowsiness, and in a few minutes their miserable existence terminated. Frequently, before death, there was an involuntary emission of urine, and sometimes hemorrhage from the nose. Almost all the men who perished in this manner, were found lying with their faces downwards. The skin was without alteration of colour, or any appearance of gangrene. In general, death took place more or less rapidly, according as the subject had been fasting a longer or shorter time.§

It has been a question whether the human body, after being frozen, can ever be restored to life. Richter asserts the possibility of recovery, *when the blood in the heart itself is not turned into ice; when this organ and large blood-vessels still retain a degree of vitality; and there is no extravasation in the brain* to render the thing impracticable. And he declares that persons, who have lain in a frozen state as

* Thomson's Lect. on Inflammation, p. 624.

† Reeve's Essays on Torpidity.

‡ Phil. Trans. 1792, and Currie's Med. Reports on the Effects of Water, vol. i. chap. 15.

§ Larrey, Mémoires de Chir. Militaire, t. iv. p. 127-129. His description, however, is rather that of people dying from the combined effects of cold, hunger, and fatigue, than from cold alone.

long as four and six days, have been restored to life.* After a full consideration of this subject, I think there can be no doubt that Richter is in error; and that the cases of recovery to which he adverts, were only instances of restoration from a state in which suspension of sensation, voluntary motion, &c. had been induced by cold, and not examples in which the whole body, or even the greater part of it had been frozen. In order to ascertain the truth or falsity of an assertion, that some animals, especially serpents and fish, can recover their vitality after being frozen, Mr. John Hunter instituted a number of interesting experiments on the power of different animals in resisting the agency of cold. Two carps were gradually frozen, with the aid of a freezing mixture, and did not recover. It was with great difficulty that he succeeded in freezing a dormouse, such were its powers of evolving heat, and the non-conducting quality of its integuments; and it was not till the hair had been wetted that life was destroyed. This animal also did not recover. When a toad was exposed to a similar cold mixture, the water froze round the animal so as to enclose it, but without destroying life: yet, though not frozen, it hardly ever recovered the use of its limbs. The conclusion drawn from these experiments was, *that an animal must be deprived of life before it can be frozen.*† On the other hand, Hearne says, that spiders frozen so hard as to bound from the floor like a pea, were revived by being brought to the fire. Leeches, snails, grubs, and frogs, have been frozen to a certain degree by artificial cold, and revived. Other experiments have also proved, that frogs would revive even if the heart was frozen, but not if the brain congealed, after which they could not be affected by the galvanic action.‡ Captain Franklin, in his Northern Expedition, repeatedly saw fish, especially carp, recover after having been congealed by cold into a solid mass of ice; and one carp recovered so far as to leap about with much vigour, after it had been frozen for thirty-six hours.§ We learn from Professor Thomson, however, that in the year 1785, a variety of experiments were made at the Royal Medical Society of Edinburgh, in order to discover some of the effects which exposure to intense degrees of cold produces upon warm-blooded animals. In these experiments it was uniformly observed that death took place

* Vol. cit. p. 119.

† See Philosoph. Trans. vols. lxxv. and lxxviii.; and Hunter on certain Parts of the Animal Economy, pp. 100, 101.

‡ Quarterly Review, No. lvi. p. 382.

§ Franklin's Journey to the Shores of the Polar Sea, p. 248. 4to. 1823.

long before the irritability of the heart and other internal parts was destroyed, and at a time when the temperature of the blood, circulating in the heart and larger blood-vessels, was but little, if at all, reduced below 60° of Fahrenheit.* How far these various facts can be reconciled by the different effects of artificial and natural freezing, or by the less pernicious operation of severe cold upon similar classes of animals in the polar regions, than in milder climates, I cannot presume to conjecture; but I have no doubt, that in whatever manner this physiological question may be hereafter settled, with respect to the lower animals, the truth of Mr. Hunter's inference with regard to the human subject, will remain unshaken. Whoever will advert to any of the most remarkable examples on record, where persons have recovered after being exposed for a length of time to extraordinary cold, will find that the particulars by no means justify the conclusion that such cases were instances in which the whole body, or the greater part of it, had been frozen. We may be sure that this did not happen in the case of Elizabeth Woodcock, who lay buried six feet under the snow, and without food, from Saturday Feb. 2d, to Sunday Feb. 10th, 1799; for it is expressly related that she was sensible the whole time;† a state which cannot be supposed to be compatible with a general congelation of the blood, and other fluids in the system. The French peasant Boutillat was lost in a snow storm on the Black Mountains, which separate France from Spain, and lay asleep under the snow four days; but on the fifth morning he awoke with a sensation of thirst. How could this return of sense and intellect have happened, had the whole mass of the blood been in a frozen state? Or, if it be thought that the fluid was in a state of congelation only while the man lay asleep and senseless, by what alteration of circumstances is the thawing of the blood to be accounted for, since he awoke buried under the snow, breathing through a hollow cone, which, as in the instance of Elizabeth Woodcock, extended from his body to the surface of the snow?‡ Nor could the circulating fluids have been frozen to a great extent in three other individuals, whose remarkable case is upon record, since in such condition, they would not have been in constant dread of being starved.§ The very existence of sensa-

* Thomson's Lect. on Inflammation, p. 642.

† Reeve's Essay on Torpidity, p. 109.

‡ Pilhes, in Journ. de Médecine, Paris, 1767, tom. xxvii.

§ Narrative of three women saved, who were buried 37 days under the snow, in a stable at Bergemoletto in Italy, by F. Soumis, 12mo. 1739.

tion and intelligence proves, that, in none of these cases, a completely frozen state of the body or of the blood, could have taken place. Had this last state been induced, no doubt recovery would have been out of all possibility, notwithstanding the contrary sentiments which have been published on this point, by Fabricius, Hildanus, Richter, &c.*

TREATMENT OF PERSONS IN A STATE OF TORPOR OR SUSPENDED ANIMATION FROM COLD.

One great principle, insisted upon by practical writers, is to let caloric be communicated to the body in the most gradual manner.† From observations and experiments, (says Mr. Hunter,) it appears to be a law of nature, in animal bodies, that the degree of external heat should bear a proportion to the quantity of life. When life is weakened, this proportion must be adjusted with great accuracy, but, when the powers of life are considerable, a greater latitude is allowable. “I was led (he observes) to make these observations, by attending to persons who are frost-bitten, the effect of cold in such cases being that of lessening the living principle. The powers of action remain as perfect as ever, but weakened, and heat is the only thing wanting to put these powers into action; yet, that heat must at first be gradually applied, and proportioned to the quantity of the living principle, which increasing, the degree of heat may likewise be increased. If this method is not observed, and too great a degree of heat is at first applied, the person, or part, loses entirely the living principle, and mortification ensues. Such a process invariably takes place with regard to men: and the same thing, I am convinced, happens to other animals. For, if an eel is exposed to a degree of cold, sufficiently intense to benumb it till the remains of life are scarcely perceptible, and still retained in a cold of about 40°, this small proportion of living principle will continue for a considerable time, without diminution or increase; but, if the animal is afterwards placed in a heat of about 60°, after showing strong signs of returning life, it will die in a few minutes. Nor is this circumstance peculiar to the diminution of life by cold. The same phenomena take place in animals, which have been very much reduced by hunger. If a lizard or snake, when it goes to its

* For many judicious observations on this topic, consult Thomson's *Lect. on Inflammation*, p. 642-644.

† Richter, *Anfangsgr. b. i. p.* 123. Callisen, *Syst. Chir. Hodiern. t. i. p.* 309.

autumnal hiding place, is not sufficiently fat, the living powers are, before the season admits it to come out, very considerably weakened, perhaps so much, as not to permit of the animal being again restored. If animals in a torpid state are exposed to the sun's rays, or placed in any situation, which by its warmth would give vigour to those of the same kind, possessed of a larger share of life, they will immediately show signs of increased life, but quickly sink under the experiment, and die; while others, reduced to the same degree of weakness, as far as appearances can discover, will live for many weeks, if kept in a degree of cold proportioned to the quantity of life they possess." "I observed many years ago, (says Mr. Hunter,) in some of the colder parts of this island, that, when intense cold had forced blackbirds or thrushes to take shelter in outhouses, such of them as had been caught, and were, from an ill-judged compassion, exposed to a considerable degree of warmth, died very soon."*

I have deemed it advisable to cite these sentiments of Mr. Hunter, with some of the facts upon which they are founded, in consequence of my having read, in some modern works of high repute and extensive circulation, that, in cases of suspended animation, or torpor from cold, the patient may be safely brought into a warm, but well ventilated room, chafed with warm flannels, and his feet and legs immersed in warm water.† Dr. Kellie does not think the same caution and reserve necessary in the application of heat to a case of general torpor, as to benumbed and frost-bitten limbs. In the latter occurrence, he admits, heat should be very gradually communicated, but (says he) surely we would not commence the treatment of a case of general torpor, nearly approaching to death, by applying snow to the body. He argues, that there does not appear to be the same danger of violent re-action, or of destroying by premature stimulation, an accumulated excitability in general torpor, where the sensorial functions have been all along suspended, as in a partial affection, where, notwithstanding the injury done to the part, the general powers of the system have remained excitable. Notwithstanding the ingenuity of the reasoning which Dr. Kellie has adopted, I am far from thinking the practical principles, to which the observations of Mr. Hunter tend, are at all erroneous. The case related by Dr. Kellie was not an example in which the

* Observations on certain Parts of the Animal Economy, by J. Hunter, 4to. p. 137. 2d edit. Lond. 1792.

† Kellie, in Edin. Med. and Surg. Journ. vol. i. p. 312. Rees's Cyclopædia, art. *Cold*.

vital powers were reduced altogether by cold. The temperature to which the individual had been exposed was not indeed depressed to a degree generally incompatible with activity and life, but he was reduced by fatigue and fasting, and the effects of the atmospheric cold were increased by the drizzling rain which fell. The blood which flowed from the arm was judged to be of its natural temperature. This was, therefore, a case in which the temperature of the patient could hardly have been low enough to afford any criterion of the safety or danger of suddenly exposing a person to much warmth, who has been subjected to the effects of intense cold. If the facts mentioned by Hunter had left this matter doubtful, we might still be convinced of the truth of his observations by other events upon record. The limbs of the peasant Boutillat, whose case I have already noticed, were covered with warm linen, dipped in aromatic liquors; his feet mortified, and he lost his life. These consequences, Dr. Pilhes thinks, might have been avoided by the use of cold applications.* The ample experience of Larrey, who was an eye-witness of all the disasters of Napoleon's campaign in Russia, appears also to confirm the truth of the principle inculcated by Hunter, Richter, Callisen, &c. In describing the sufferings of the French army from the rigour of the climate, Larrey exclaims, "Wo to the man benumbed with cold, whose animal functions were nearly exhausted, and especially whose external sensibility was destroyed, if he entered too suddenly into a warm room, or came too near the fire of a bivouac! The prominent parts, benumbed or frozen at a distance from the centre of the circulation, were seized with gangrene, which made its appearance at the very instant, and spread with such rapidity, that its advances were perceptible by the eye, or the individual was suddenly suffocated with a kind of turgescence, which appeared to affect the brain and lungs: he perished as in asphyxia. Thus died the chief apothecary of the Guards. He had arrived at Kowno without any accident, but his strength was much reduced by cold and abstinence. An asylum was offered him in a warm apartment in the pharmacy of the hospital. He had scarcely been a few hours in this atmosphere, so new to him, when his limbs, in which he had lost all feeling, became considerably swelled, and he expired soon afterwards in the arms of his son and one of his colleagues, inca-

* Journ. de Médecine, tom. xxvii.

pable of uttering a single word. We saw some individuals fall down stiff-dead in the fires of the bivouacs," &c.*

In describing the treatment of a person in a state of torpor, or suspended animation from cold, Callisen and Richter rigorously adhere to the principle, that caloric should be very gradually communicated to the body. The former recommends long-continued frictions with snow, or cloths wet with very cold water. This is to be done in a cold room, and he advises the surgeon not to let his endeavours cease too soon, as patients, after lying without signs of life for several days, have yet been snatched from the jaws of death. On the return of sense, motion, and warmth, aromatic spirituous applications may be used; the temperature in which the body is placed may be raised, and cordials administered.† When signs of vitality return, Richter directs strong volatiles and sternutatories to be applied to the nostrils, air to be blown into the lungs, and the fauces to be tickled with a feather. He also recommends the introduction of tobacco-fumes up the rectum, a practice, however, the propriety of which is questionable in all cases of suspended animation, on account of the debilitating, and even deleterious, effects of that plant. It might be better to throw warm wine into the large intestines, or inject it by means of a hollow bougie down the œsophagus. When the signs of returning animation increase, the body is to be rubbed with brandy, and conveyed into a warmer situation. A diaphoretic drink is then to be given, and, as soon as the patient has been well dried, he is to be put to bed, and remain there till he begins to sweat.‡

Possibly these eminent surgeons may have extended the principle too far, in directing the body to be at first covered or rubbed with snow. But I think we have every reason to believe, that their method of allowing the heat to be communicated only by degrees, is the most likely to be conducive to recovery.

TREATMENT OF FROZEN PARTS.

As in all the experiments which Mr. Hunter made upon the freezing of whole animals, he had never seen life return by thawing, he was desirous of ascertaining how far parts were similar to the whole in this respect. He froze the ears

* *Mém. de Chir. Mil.* tom. iv. pp. 134, 135.

† Callisen, t. i. p. 309.

‡ Richter's *Anfangsgr.* b. i. p. 125.

of rabbits, and the combs and wattles of cocks, till the parts were so stiff and hard, that when cut, they flew from the blades of the scissors like a chip, and no pain nor bleeding ensued. After being thawed, they inflamed considerably; but, in the end, perfectly recovered. There was thus a material difference in the result of his experiments, on the whole of some of the more perfect animals, and on parts of them. But, though it was thus fully proved, that parts of such animals might be frozen, and restored to their natural state, it was not known whether this would happen in the more imperfect animals. Mr. Hunter, therefore, froze the tails of a tench, and two gold fishes, and endeavoured to restore the vitality of the parts, by putting the fish into cold water; but the tails, when thawed, did not resume their original appearance, the fish were suspended with their heads perpendicularly downwards, and ultimately died. All his other trials to restore the life of other cold-blooded animals, or of parts of them, after they had been frozen, also entirely failed.* Spallanzani also found, that the irritability of the muscles of frogs, toads, and lizards, was not destroyed by keeping these animals a good while in snow; but that, if the cold was increased, so as to freeze any part of them, the frozen part was invariably killed, and rendered insensible to stimuli.†

The experiments, however, on warm-blooded animals, corroborate what has long been believed, that when a part of the human body is simply frozen, without any impairment of its organization, it may often be recovered by the *gradual* communication of caloric to it. What parts of the human body admit of being frozen, without the destruction of life, and how long they may remain in this state with impunity, (as Dr. Thomson remarks,) are points, which observation does not hitherto appear accurately to have determined: but we know, that portions of the cheeks, ears, and nose, have often been frozen by exposure to cold, and yet, that by a proper management the vital functions of these parts have been restored. It seems probable, therefore, that a small part of the cutaneous texture may be frozen for a short period, without the necessary destruction of its vitality. But Dr. Thomson considers the restoration of a frozen limb a matter of impossibility; and in the course of his reading, he has not met with a single unequivocal instance of such an event.‡ On this point

* Obs. on certain Parts of the Animal Economy, pp. 124, 125.

† Opusculs de Physique, t. 1. p. 118.

‡ Lectures on Inflammation, pp. 628. 642.

he differs from Callisen and Richter, quite as much as upon the other question of the possibility of reviving the whole body, after it has been frozen. Whatever doubts may have been suggested, concerning the propriety of keeping patients out of a warm temperature, who are in a state of torpor and insensibility from cold, none exist with respect to the prudence of extending this principle to the treatment of very cold or actually frozen parts of the human body. If a limb, that is not indeed frozen, but excessively cold, be suddenly warmed, chilblains, frost-bite, and other more extensive forms of inflammation, are the result. The part swells, turns livid, and becomes affected with insupportable darting pain. And when a part actually frozen is thus quickly warmed, the same symptoms arise, but in an aggravated degree, and rapidly end in mortification.*

In this chapter I have already cited some facts,† strongly illustrative of the danger of exposing very cold or frozen parts to the fire; but, perhaps, on no occasion has the thing been more forcibly proved, than in the campaign of the French army about the period of the battle of Eylau. During the three or four severely cold days previous to this action, the mercury had fallen to 10, 11, 12, 13, 14, and 15 degrees below the zero of Reaumur's thermometer, and yet, until the second day after the battle, not a single soldier complained of any accident from the effect of the cold. "We had, however," (says Larrey,) "passed these days, and a great part of the nights of the 5th, 6th, 7th, 8th, and 9th of February, in the snow, exposed to the most inclement frost." In the night, however, between the 9th and 10th, the temperature suddenly rose to 3, 4, and 5 degrees above zero, accompanied with sleet. A thaw then commenced, and, from this moment, numerous soldiers began to complain of acute pain in their feet, numbness, sense of heaviness, and annoying pricking pains in their limbs. The parts were but little swelled, and of a dark-red colour. In some individuals, a slight redness was observed at the base of the toes, and upon the instep; while, in others, the toes had lost all power of motion, all sensation and warmth, and become black and dried. These patients, without exception, declared, that they had felt no uneasiness while the severe cold lasted, and that their complaints first began at the commencement of the thaw. From these facts,

* Richter, *Anfangsgr. der Wundarzneykunst*, b. i. p. 120.

† From Larrey's *Mém. de Chir. Mil.* t. 4.

Larrey argues, that cold is not an exciting, but only a predisposing cause of inflammation and gangrene;* a truth which Richter appears to have been well aware of, when he observes, that cold alone, even the most intense, will never produce chilblains.†

In order to thaw a frozen part gradually, it is best to rub it with snow, or ice and cold water, until sensibility and motion return. If the ear, or tip of the nose, be the part concerned, care must be taken to avoid breaking it. As soon as marks of sense and motion are discerned, the friction may be made with brandy, or camphorated spirit of wine. The patient may then have some gently diaphoretic drink, such as a little mulled wine, a basin of tea, &c. and be put to bed, in a chamber where there is a fire. Here he is to remain until he begins to perspire, when a perfect recovery of whatever sensibility may have been lost generally succeeds.

When a part is almost in the state of gangrene, in consequence of improper exposure to sudden heat, sometimes its recovery may still be accomplished by immersing it in water of a temperature nearly as low as the freezing point. The part must be kept immersed, until the swelling, pain, and marks of discoloration begin to diminish, when frictions with brandy, &c. may commence, and the warmth be gradually increased.

CHILBLAINS.

A chilblain, in the mild stage, is a moderately red tumor, occasioning heat and itching. The complaint after a time spontaneously disappears. In a more severe state, the tumor is larger, redder, and sometimes of a dark blue colour, and the heat, itching, and pain, are so vehement, that the patient cannot use the part. In a still severer case, small vesicles arise, which bursting and leaving excoriations, soon change into sores. The ulcers secrete a thin matter, penetrate deeply, and are very slow in healing. In the worst cases, the inflammation ends in mortification, which is often preceded by the formation of bloody vesicles on the tumor.

The sudden warming of a cold part, and the sudden cooling of a heated part, seem particularly conducive to chilblains; hence, parts most exposed to the vicissitudes of heat and cold,

* *Mémoire sur la Gangrène sèche causée par le Froid, &c. in op. cit. t.*

ii. p. 60.

† Richter, b. i. p. 124.

are most subject to the complaint; as, for instance, the toes, fingers, nose, ears, and lips. When a part is exposed to sudden cold, while it is in a state of perspiration, it is more likely to be affected with chilblains, than when thus exposed while simply warm. The most intense cold alone cannot produce true chilblains, though analogous complaints do remain in limbs which have been frozen. The more irritable and tender the skin is, the more readily the complaint arises. Children, especially those subject to scrofula, young persons, females, and all who are brought up tenderly, who keep themselves warm, and unexposed to the air, and who perspire much in the feet, are particularly liable to chilblains.

One of the best applications to chilblains of the first and second sort, is ice-cold water. The part affected is to be immersed in it a few minutes, two or three times a day, until the complaint quite disappears. This event usually happens in less than four days. After every application, the part is to be well dried and covered with leather socks.

In some cases, tonics and astringents have the best effect, such as diluted muriatic acid; the saturnine lotion; spir. vini camph. ; tinct. myrrhæ; the alum lotion, and vinegar. In other instances, oleum terebinthinæ mixed with the balsam. copaivæ; the linimentum camphoræ; the linimentum ammoniæ; tincture of cantharides diluted with soap liniment; and a mixture of two parts of spir. vini camph. and one part of liquor plumbi acet., have proved the best applications.

Suppurating chilblains require topical stimulants, such as warm vinegar; a mixture of liquor plumbi acet. and aq. calcis; or a salve containing the hydrarg. nitrico-oxydum; touch the ulcers with the argentum nitratum.

Gangrenous chilblains must be treated according to the rules explained in the chapter on mortification.



CHAPTER XII.

WOUNDS.

By a wound, surgeons imply a recent, suddenly-formed breach in the continuity of the soft parts, attended at first with hemorrhage, and generally produced by an external mechanical cause.

In a few instances, however, breaches of continuity both in

the soft and hard parts, are suddenly caused by the violent action of the muscles, which either tear themselves asunder, break the bones, or rupture the tendons with which they are connected. Sometimes, also, the sharp point of a broken bone wounds the superincumbent integuments, and changes the case into a compound fracture. Here we see that the cause is mechanical, but not of an external kind, as in ordinary examples.

Wounds are divided into several kinds, the distinctions being founded either upon the sort of weapons with which the injury was inflicted, or upon the circumstance of a venomous matter having been inserted into the part; or, lastly, upon the particular situation of the wound, and the nature of the wounded parts themselves. Hence we have *cuts*, *incisions*, or *incised wounds*, which are such as are produced by sharp-edged instruments, and are generally free from all contusion and laceration. The fibres and texture of the wounded part have suffered no injury but their mere division, and there is, consequently, less tendency to inflammation, suppuration, gangrene, and other bad consequences, than in the generality of other wounds. Incised wounds also may usually be healed with greater quickness and facility than others, which are more or less contused or lacerated: the surgeon has only to prevent the solution of continuity from gaping, or, in other words, he has simply to bring the opposite sides of the wound into contact with each other, and keep them in this state a few hours, and they will unite and grow together.

Another class of wounds is *stabs*, or *punctured wounds*, caused by the thrust of pointed weapons, like bayonets, lances, swords, daggers, &c., and also by the accidental and forcible introduction of considerable thorns, large nails, &c. into the flesh. These wounds frequently penetrate to a great depth, so as to injure large blood-vessels, nerves, viscera, and other organs of importance; and as they are generally inflicted with much force and violence, the parts suffer infinitely more injury than what would result from their simple division. It should also be noticed, that a great number of the weapons, or instruments, with which stabs are inflicted, increase materially in diameter, from the point towards their other extremity; and hence, when they penetrate far, they must force the fibres asunder, like a wedge, and cause a serious degree of stretching and contusion. It is on this account that bayonet wounds of the ordinary soft parts are very often followed by violent inflammation, extensive swelling, large abscesses, fever, delirium, and other very unfavourable symptoms. The opening which the point of such a weapon makes, is quite in-

adequate for the passage of the thicker part of it, which can only enter by forcibly dilating, stretching, and otherwise injuring the fibres of the wounded flesh.

A third description of wounds is the *contused* and *lacerated*, which strictly comprehend, together with a variety of cases produced by the violent application of hard, blunt, obtuse bodies to the soft parts, all those interesting and common injuries denominated *gun-shot wounds*. Many bites also rank as contused lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon, which does not operate by means of a sharp edge, or point, must be a contused or lacerated wound.

Poisoned wounds are those which are complicated with the introduction of a venomous matter, or fluid, into the part. Thus the stings and bites of a variety of insects afford us examples of poisoned wounds. But a more serious and dangerous instance, which we meet with in this climate, is seen in the cuts accidentally received in the dissection of dead bodies, or in handling instruments infected with any irritating or venomous matter, as sometimes happens to the surgeon in the performance of operations on gangrenous limbs, and in dressing venereal and other infectious ulcers. The most dangerous, however, of all the poisoned wounds which ever occur in this kingdom, are those caused by the bite of the viper, and by that of several rabid animals, especially the dog and cat.

Wounds are farther divided by surgical writers into those of particular regions, or parts of the body: thus, we have *wounds of the head, face, throat, chest, abdomen, limbs, arteries, veins, nerves, lungs, liver, &c. &c.*

Wounds may likewise be universally referred to two other general classes, viz. *simple* and *complicated*. A wound is called *simple* when it occurs in a healthy subject; has been produced by a clean sharp-edged instrument; is unattended with any serious symptoms; and the only indication is to reunite the fresh-cut surfaces. A wound, on the contrary, is said to be *complicated*, whenever the state of the whole system, or of the wounded part, or wound itself, is such as to make it necessary for the surgeon to deviate from the plan of treatment requisite for a common simple wound. The differences of complicated wounds, therefore, must be very numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage; nervous symptoms; excessive pain; tetanus; a great degree of contusion; the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels; the presence of foreign

bodies, or of a poison, or irritating matter in the part; loss of substance; the attack of hospital gangrene, &c.

All large or deep wounds are followed by more or less symptomatic fever. According to Professor Thomson, it usually comes on at a period varying from sixteen to thirty-six hours after the receipt of the injury; but, as far as my observation extends, the attack is frequently much earlier than the time here specified. Its occurrence is indicated by a greater warmth of the skin; by an increase in the frequency, and generally also in the strength of the action of the heart and arteries; by anxiety, thirst, and a suppression of the powers of digestion. The symptomatic fever from wounds is generally of the inflammatory character; and it even sometimes happens that a very high degree of it takes place in debilitated constitutions, and in persons who have lost a considerable quantity of blood. In these latter cases, however, the frequency of the pulse is said to be more remarkable than its strength, and the fever rather to put on the asthenic, than the truly inflammatory type. It is of great consequence to attend to the character of this fever; for the loss of blood, which may be required and sustained with impunity in one species of fever, may prove highly injurious, if not fatal, in the other.*

The danger of wounds is proportioned to their size; the degree of violence done to the fibres in addition to their mere division; the little power which the part has of repairing its injuries; its great importance to the constitution; the size of the injured blood-vessels and nerves; and the age and state of the patient's constitution.

1. The removal of a large adipose tumor is often accomplished without injuring any part of importance, and yet the magnitude of the wound may occasion death.

2. A man cannot bear a large incised, and lacerated wound equally well; because in the latter case, the fibres are not only divided, but stretched, and otherwise injured. I have seen the integuments, covering the anterior surface of the tibia, torn in a straight direction, from the upper head of that bone, nearly to the foot: a rapid mortification of the limb took place, and the man died. Had this been a simple incision, such fatal consequences would probably not have happened, since the wound of amputation, even when a bulky thigh is removed, is not frequently the cause of death. All contus-

* See Thomson's Lectures on Inflammation, p. 292.

ed and gun-shot wounds are, for this reason, more perilous, than if they were simple breaches of continuity.

3. Joints seem to possess but little power of repairing their accidental injuries, which often induce a state of irremediable disease in the part, or so violent a disturbance of the whole system, that the patient loses his life. I here more especially allude to wounds of the large joints; for the smaller articulations generally bear extensive injuries as well as most other parts. Some other parts are also prevented from readily healing, owing to the continual or frequent passage of fluids through them. This is the case with all the ducts and outlets of secreting organs, the intestinal canal, the arteries, &c.

4. The slightest wound of a part, the functions of which are intimately connected with life, is often fatal; the brain, stomach, &c.

5. When large arteries are injured, the hemorrhage, if not immediately stopped, will destroy life in a few seconds; and, when the main artery and nerve of a part are both divided, there is generally a considerable risk of mortification, in addition to the first danger from the bleeding.

6. Wounds in young, strong, healthy subjects, generally heal more quickly and favourably, than in persons of advanced age, and impaired constitutions.

INCISED WOUNDS.

An effusion of blood from the divided vessels, pain arising from the division and exposure of nerves, and a gaping of the wound, or separation of its edges from each other, are the immediate effects of a wound of the skin, or flesh, with a sharp cutting instrument.

Anatomy teaches us that almost every part of the body is furnished with a vast number of blood-vessels, which, indeed, exist in such myriads that it is impossible to prick the skin with the point of the finest needle, without opening one or more ramifications of vessels containing blood, which fluid instantly oozes out. But this effect always happens in a greater or more remarkable degree when there is an extensive cut in the skin or flesh; and if any of the wounded vessels be above a certain magnitude, the hemorrhage may be profuse, and even immediately fatal.

The same experiment which demonstrates the presence of blood-vessels in every situation, namely, pricking any part of the body with a needle, proves also, that filaments of the nerves exist every where, and at every point; for the slightest prick of the skin occasions pain; and pain cannot happen

except where there are nerves. The pain of wounds is observed to be more or less acute, according to the kind of cutting instrument with which they have been inflicted; the extent of the division; and, especially, according as the individual happens or not to be in expectation of the receipt of the injury. A patient, on whom an operation is to be performed, turns his whole attention to the effect which the use of the knife will produce upon his feelings, and he suffers a great deal; but if an incision be made when not expected, or when the mind is intent on other things, the agony is more moderate. Thus, a soldier may be wounded in the heat of battle, and not feel the hurt till the bleeding attracts his notice.

When the skin, or flesh, is divided with a cutting instrument, the edges of the wound separate from each other, and the injury presents a gaping appearance. The instrument itself, acting like a wedge, must unavoidably separate the parts between which it enters; but, if this were the only cause, the gaping would be very inconsiderable. We find, however, that the opposite surfaces of many wounds are drawn away from each other several inches, and the principal causes to which the phenomenon is to be ascribed, are the natural elasticity of the skin, cellular membrane, fasciæ, &c.; and power of contraction, inherent in the muscles.

The quality of elasticity which belongs to most animal substances, and is inherent in them even after they have been deprived of life, does not prevail in an equal degree in every texture. Hence, the degree of separation, produced by this cause, varies considerably, according to the nature of the wounded parts. The edges of an incision in the skin become widely drawn asunder, because the integuments are endued with great elasticity. The cellular membrane, when cut, gapes very little, because it is less elastic. The extremities of a divided artery recede far from each other; the retraction being far greater than what happens in divided veins, which possess a much smaller share of elasticity. The muscles, also, are not remarkably elastic; yet, the sides of these wounds, especially those of the transverse kind, are always considerably separated from each other; but this is not altogether owing to elasticity, but chiefly to a vital power of contraction inherent in muscular fibres.

The separation of the edges of a wound is also not always in proportion to the elasticity of the parts, but depends in some measure upon the degree of tension in which they happen to be at the moment of the injury. A simple experiment proves the truth of this observation: if the skin covering the knee be divided transversely in a dead subject, while the leg

is bent upon the thigh, and another similar incision be made in the knee, while the leg is extended, the separation which happens between the lips of these wounds will be found to be much greater in the first than the second example.

The prognosis of incised wounds varies according to the extent and depth of the division, the nature of the injured parts, and several circumstances which rank as complications. Deep large wounds are more dangerous and difficult to cure, than those which only interest the skin. Wounds, accompanied with injury of large blood-vessels, or nerves, are more or less dangerous, according to the magnitude and importance of those vessels and nerves, and the possibility, or impossibility of obtaining speedy surgical assistance. Simple cut wounds, in which the only indication is to bring the divided parts together, are the most favourable cases of all. On the other hand, complicated incised wounds are more or less serious and hazardous, according to the particular nature of the complication, whether this be a wounded artery, vein, or nerve of magnitude and importance; a wounded excretory duct; a wounded bowel; a wounded trachea; œsophagus, &c. The complications also of bad health, and very advanced age, are other considerations which should influence the prognosis. Generally speaking, the most dangerous examples of incised wounds are those which are made about the throat, by persons who attempt to destroy themselves. Here there are so many large blood-vessels, nerves, and other organs of importance, that deep incised wounds too often prove fatal, either immediately, or in a short time. Sometimes the patient opens the carotid artery, and perishes of hemorrhage on the spot, before any assistance can be rendered. In other instances, he divides some of the principal branches of the external carotid, and after losing a great deal of blood, faints, in which state the hemorrhage may cease for a little while. The fainting, indeed, is often the very thing which saves his life, by checking the effusion of blood until the surgeon arrives, who ties the vessels as soon as they begin to bleed again. Incised wounds of the extremities, when such arteries as the femoral and brachial are injured, may also suddenly destroy the patient by the great quantity of blood sometimes lost before the arrival of surgical assistance.

I shall next consider the treatment of incised wounds.

In these cases, there is frequently nothing to be remedied, except the simple breach of continuity, the cut fibres not having been stretched, contused, nor lacerated. When no artery of importance is divided, and no extraneous bodies are lodged

in the wound, the duty of the surgeon consists in promoting the reunion of the divided surfaces without delay.

It often happens, however, that considerable vessels are injured, and then the bleeding demands primary attention.



CHAPTER XIII.

MEANS OF STOPPING HEMORRHAGE.

IN every wound, the bleeding demands the earliest attention, because, if loss of blood be not prevented without delay, the patient will frequently die in the course of a few seconds or minutes. Every other consideration may be deferred; but, when large vessels are injured, they must be immediately secured, or else the sudden death of the patient will leave the surgeon no opportunity of exhibiting his skill and usefulness in other matters connected with the treatment.

Previously to considering what surgical means are best calculated for stopping hemorrhage, it seems right that I should endeavour to give the reader some notion of the nature of the process, by which the bleeding from wounded arteries is permanently suppressed. Arteries, as Dr. Jones observes, are supplied not only with small arteries and veins (the *vasa vasorum*,) but also with absorbents and nerves, and have, in these respects, a similar organization to the other soft parts of the body. This structure makes them susceptible of every change to which living parts are subjected in common, enables them to inflame when injured, and to pour out coagulating lymph, by which the injury is repaired, or the tube is permanently closed.* In short, the coats of arteries inflame, and pass through all the stages of adhesion, suppuration, or gangrene, in the same manner as the skin, a gland, or a muscle.†

Surgeons formerly entertained various theories concerning the process, by which the hemorrhage from divided arteries

* Treatise on the Process employed by Nature in suppressing the Hemorrhage from Divided and Punctured Arteries; and on the Use of the Ligature; concluding with Observations on Secondary Hemorrhage, p. 5. 8vo. Lond. 1805.

† Hodgson on the Diseases of Arteries and Veins, p. 1. 8vo. Lond. 1815.

was suppressed; but, as none of these seemed altogether satisfactory, the late Dr. Jones was led to undertake a series of interesting experiments, the results of which enabled him to give a more correct view of the subject; and, from these investigations, it appears, that when an artery of moderate size is *divided*, the bleeding is stopped in the following manner: An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath, and a slight contraction of its extremity, are the immediate, and almost simultaneous effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused in the cellular substance, between the artery and its sheath, and passing through that canal of the sheath, which had been formed by the retraction of the artery, flows freely outward, or is extravasated in the surrounding cellular membrane, in proportion to the open or confined state of the external wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating, or stretching the cellular fibres which connected them. These fibres entangle the blood as it flows, and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, and which is completed by the blood gradually adhering, and coagulating around its internal surface, till it completely fills it up from the circumference to the centre.

The hemorrhage is checked by the effusion of blood into the surrounding cellular substance, and between the artery and its sheath; but, particularly, by the diminished velocity of the circulation, occasioned by the bleeding, and by the quick manner in which the blood always coagulates, when the action of the vascular system is much diminished.

Thus a clot over the mouth of the artery, within its sheath, called by Dr. Jones the *external coagulum*, presents the first complete barrier to the effusion of blood.

The mouth of the artery being no longer pervious, and having no collateral branch very near it, the blood, just within it, is at rest, coagulates, and forms, in general, a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, which lies near the extremity of the vessel. This coagulum is distinct from the former, and is named by Dr. Jones the *internal coagulum*.

In the mean time, the cut extremity of the artery inflames, and the vasa vasorum pour out lymph, which is prevented from escaping by the external coagulum. This lymph fills up the extremity of the artery, is situated between the internal

and external coagula of blood, is somewhat intermingled with them, or adherent to them, and is firmly united all round to the internal coat of the artery.

The permanent suppression of the hemorrhage chiefly depends on this coagulum of lymph; but while it is forming within, the extremity of the artery is further secured by a gradual contraction, which it undergoes, and by an effusion of lymph between its tunics, and in the cellular membrane surrounding it. Thus, these parts become thickened, and so completely incorporated with each other, that one cannot be distinguished from the other; the canal and mouth of the artery becoming obliterated and blended with the surrounding parts.

When the wound in the skin is not healed by the first intention, an exudation of coagulating lymph gives a covering to the end of the vessel, and separates it from the cavity of the wound.

In the inferior portion of the divided artery, the orifice of the vessel is generally more contracted, and the external coagulum is much smaller.

The extremity of the artery, as far as the first collateral branch, afterwards gradually contracts, till at length its cavity is completely obliterated, and its tunics assume a ligamentous appearance.

The external coagulum, which stopped the hemorrhage in the first instance, is absorbed in a few days, and the thickening of the parts, from the extravasation of lymph, gradually diminishes.

If the end of the artery be examined, at a still later period, it will be found to be reduced to a mere filamentous state, as far as its first branch, and the anastomosing branches are considerably enlarged.

Another fact, made out by Dr. Jones, is, that, when the division of an artery has happened near a lateral branch, no internal coagulum is formed.

When an artery is *punctured*, or only *partially divided*, the blood is effused in the cellular substance, between the artery and its sheath, for some distance, both below and above the wounded part. On examination, a short time after the hemorrhage has stopped, a stratum of coagulated blood is found between the artery and its sheath, extending from a few inches below the wounded part, to two or three inches above it, and is somewhat thicker, or more prominent, just over the wounded part, than elsewhere.

In consequence of the space between the artery and sheath becoming filled with blood, and the latter part distended, the

relative situations of the punctures in it and the artery are altered, and thus a coagulum of blood becomes confined by the sheath over the puncture in the vessel, and stops the hemorrhage. But this is only a temporary barrier; and the permanent stoppage of the bleeding is effected by reparation, or obliteration.

Dr. Jones's experiments also prove, that if an artery be wounded only to a moderate extent, it is capable of reuniting, and of healing so completely, that, after a certain time, the cicatrization cannot be discovered, either on its internal, or external surface; and that even oblique and transverse wounds (which are attended with more gaping than longitudinal ones,) when they do not open the artery to a greater extent than one fourth of its circumference, are also healed, so as to occasion little or no obstruction in the canal of the artery. But, as Petit observed, this can hardly ever happen, except when the aperture in the vessel has been of very moderate size.* In larger wounds, the vessel is rendered impervious by the effusion of lymph; and, when the division is still more extensive, the partially divided part of the vessel becomes either torn, or ulcerated through.†

1. TOURNIQUET.

A modern tourniquet, that which is in common use, consists of a band and buckle, a pad, and two brass frames, the upper one of which is furnished with two small rollers, and the lower with four, over all of which the band plays, so as to facilitate the action of the screw. When the handle of this is turned to the right or left, the band is tightened, or relaxed, in the exact degree which the surgeon wishes. A piece of leather, under the lower brass frame, hinders the skin from being hurt at this point by the pressure of the edges of the hard metal. The buckle is prevented from having this effect by its being always fastened over the pad. The band is first buckled round the limb in such a manner, that the pad, which is attached to the band, is placed exactly over the artery. The two brass frames, with their respective rollers, over which the band proceeds, are then made to separate from each other to the requisite distance by turning the screw, and thus the due degree of pressure is produced.

The advantages of this instrument are so considerable, that

* *Mém. de l'Acad. Royale des Sciences*, an. 1735.

† Jones, *op. cit.* chap. i. sect. 3. and chap. ii.

its first invention constitutes a great epoch in the annals of surgery. The pressure may be regulated with the utmost exactness, and it operates with most force on the point where the pad is placed, and under which the main artery lies. The instrument does not require the aid of an assistant to keep it tense; it completely commands the flow of blood into a limb; it may be relaxed, or tightened in a moment; and where there is reason to fear a sudden renewal of bleeding, it may be left slackly round a limb, and, in case of need, made tense in an instant.

Its operation, however, is limited to the limbs, and as the pressure, necessary to impede the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made very long, without inducing gangrene. Hence, it is only a temporary expedient for the stoppage of bleeding, generally discontinued immediately the surgeon has had time to adopt other means of a more permanent nature.

The tourniquet is occasionally applied in a moderate state of tension, with the view of weakening, not suppressing, the current of blood in a limb. The common one, however, does not accomplish this object advantageously, because, by retarding the return of blood through the veins, it has the effect of rendering the arteries more charged with blood; consequently, any that are wounded more likely to bleed. In cases of aneurisms, where this plan is sometimes practised, the compression of the veins does infinite harm, by augmenting the œdema, and painful tension, so frequently attendant on that disease.

2. LIGATURE.

The most important of the means which has a permanent effect in the stoppage of bleeding, by producing a closure of the wounded vessels, is the ligature, by which the most alarming bleedings may be restrained. With this, the mouths of the divided arteries are tied, and thus, not only an instantaneous stop is put to further hemorrhage, but, long before the ligature becomes loose, the opposite sides of the vessels have generally grown together, and all danger of the renewal of the bleeding is over.

Several of the conclusions, drawn from Dr. Jones's experiments upon the subject of hemorrhage, are of the highest importance, in relation to the practice of surgery, and, were they all of them universally admitted, little doubt would remain about the most advantageous manner of making and ap-

plying ligatures. That a ligature, especially a small one, when applied round an artery with a proper degree of tightness, cuts completely through the inner coats of the vessel, is a fact which is now acknowledged by all the best informed writers on surgery, whatever may be their sentiments about other contested points in regard to the best mode of tying arteries. But whether we should employ such ligatures, as are expressly calculated to produce this effect, and whether we should aim at it, as a beneficial and useful, not to say an essential object, are questions on which the greatest authorities are yet divided. From a variety of experiments, Dr. Jones was led to infer, that the division of the membranous and muscular coats of a tied artery by the ligature had a principal share in bringing on the effusion of coagulating lymph within the vessel, or, in other words, the process of adhesive inflammation, by which the permanent closure of the vessel was effected. He observes, that when a ligature is properly applied, it cuts through the internal and middle coats of the artery, keeps their cut surfaces in contact, and affords them an opportunity of uniting and cicatrizing, as other cut surfaces do, by the adhesive inflammation. Nay, he extended the doctrine further, by representing the division of the internal coats of the vessel by the ligature, not merely as advantageous, but as absolutely indispensable ; for he remarks, that if the ligature does not completely cut through the internal and middle coats, all round the artery, adhesion cannot take place between its internal surfaces, and, therefore, secondary hemorrhage will take place as soon as the ligature has ulcerated through any part of the artery.*

That Dr. Jones erred in describing the division of the inner coats of the vessel as a thing without which the vessel could not be closed by the process of adhesive inflammation, remains no longer questionable. The assertion, as Mr. Cramp-ton† has observed, rested upon no other foundation, than several experiments, made on the arteries of quadrupeds, in *all of which* the internal and middle coats were ruptured by the application of the ligature. No comparative experiments are related in order to show, that this operation of the ligature is essential to the process of union, and that, under these circumstances only, the obliteration of the artery can take place. Numerous instances are recorded of arteries being obliterated by the pressure of tumors. The subclavian and carotid have

* On Hemorrhage, pp. 166 and 170.

† Medico-Chir. Trans. vol. vii. p. 343.

been found obliterated by the pressure of an aneurism of the arch of the aorta.* In Mr. Freer's experiments, the pressure of a tourniquet for four days was sufficient to effect the obliteration of the radial artery in horses.† Mr. Hunter observed, that in dogs, the mere exposure of the tibial artery to the air for about an hour, excited such a degree of inflammation and thickening of its coats, as completely obstructed the canal.‡ All the great arteries, the aorta inclusive, have been found obliterated, in consequence of the effusion of lymph from their internal coat, and this independently of any injury which could produce the rupture of that membrane. The cure of aneurism by compression, (whether mediate or immediate) affords an example of the obliteration of an artery without any rupture of its internal coats.§

In the course of the interesting experiments undertaken by the late Dr. Jones, he found, that when a ligature is tightly applied round a large unwounded artery in a quadruped, so as to cut through the internal coats, and it is immediately afterwards removed, the adhesive inflammation takes place at the part of the vessel, embraced by the ligature, and the canal of the artery becomes permanently obliterated for some extent. This consequence happened, however, with increased certainty, when two or more ligatures were thus applied near each other, and then taken off.||

The promulgation of these observations at first excited hopes that the leaving of a ligature, on arteries, tied for the cure of aneurisms, might be dispensed with; and what Dr. Jones had himself succeeded in accomplishing, did not fail to convince him still more firmly, that the division of the inner coats of the artery was the main exciting cause of the adhesive inflammation, by which the canal of the vessel was permanently closed; and that the obliteration could not happen unless those coats were cut through by the ligature. But, as Mr. Travers has observed, the result of these experiments neither warranted the conclusion, that the complete division of the internal coat was necessary to union, nor that union was a necessary consequence of it. The history of the broad tape, or riband ligature, proves, that contact without wound will sometimes produce adhesion, and the frequent repetition of

* Hodgson on the Diseases of Arteries and Veins, p. 110. A. Cooper in *Med. Chir. Trans.* vol. i. p. 12.

† *Obs. on Aneurism*, p. 14.

‡ *On the Blood*, &c.

§ Crampton in *Med. Chir. Trans.* vol. vii. p. 345.

|| Jones on Hemorrhage, p. 126, &c.

Jones's experiment has proved, that wound without contact will often fail to produce it. Mr. Dalrymple, of Norwich, repeated the second experiment in Dr. Jones's third chapter, not less than seven times on horses, and three times on sheep, and in every instance failed in obtaining the same results as Dr. Jones. Not only was no coagulum formed, but, even when the animal had been suffered to live until the thirteenth, fifteenth, or eighteenth day after the operation, the canal of the artery was not found obliterated. Its calibre was indeed contracted; but the tube remained in some degree pervious, and capable of transmitting a lessened column of blood.* The evidence of another eminent writer also coincides precisely with that of Mr. Dalrymple.†

Dr. Jones's idea, that the division of the internal coats was essential to the production of the requisite degree of adhesive inflammation for the obliteration of the cavity of the artery, is completely refuted, not only by the facts adverted to by the preceding authors, but by a variety of other considerations. A ligature was put round the carotid of a dog without being drawn. It lay in contact with the artery, but did not press upon it, nor interrupt the flow of blood through it. The result was an obliteration of that part of the vessel which was irritated by the presence of the ligature. The same experiment was made on the carotid of an ass with a similar consequence.‡ Here then we have further proofs, as unequivocal as any of those previously cited from Mr. Crampton's valuable paper, that the internal coat of an artery will effuse coagulating lymph when any cause of sufficient irritation exists on the outside of the vessel, and that the division of its inner coats by a ligature is by no means essential to the excitement of the adhesive inflammation within it.§

As Scarpa remarks, all parts which resemble each other, and especially serous membranes, including the inner coat of the arteries, when kept in close contact in sufficiently vigorous subjects, generally assume with surprising quickness the adhesive inflammation in the seat of the compression, and around it, evincing a singular propensity to effuse coagulating lymph, and, though such membranes are inflamed, they

* Travers in *Med. Chir. Trans.* vol. iv. p. 442.

† Hodgson on *Diseases of Arteries*, &c. p. 228.

‡ C. Bell, *Surgical Obs.* vol. i. p. 261.

§ See also Crampton's Experiments with a flat ligature, and piece of metal, on the carotids of sheep, in *Med. Chir. Trans.* vol. vii. p. 346, and other experiments detailed by Scarpa in his *Memoria sulla Legatura delle principali Arterie degli Arti*, &c. Fol. Pavia, 1817. p. 34, et seq.

remain free from all ulceration, or breach of continuity. This is daily seen between the lungs and pleura, between the peritoneum and the viscera of the abdomen, and between the tunica vaginalis and the testicle. And, in order to assure ourselves that the same phenomenon also happens betwixt the two opposite sides of an artery, which are simply held in close contact with each other, without any previous ulceration, or rupture of them, we need not have recourse to analogy in what takes place under the same circumstances in other similar parts of the body, since there are numerous instances of the quick union and perfect closure of an artery, by means of the adhesive inflammation, under simple compression alone, practised upon the artery while all its parts remain entire. Dubois* effected this prompt adhesion by means of the serrenœud of Desault; Assalini,† by compressing the artery with his forceps; and Crampton with a presse-artère, resembling that of Deschamps. To these facts, we are to add numerous others of the closure of the artery, in consequence of pressure made on the vessel by a neighbouring tumor, or an aneurismal sac. If the ligature were absolutely preferred to compression, in the treatment of external aneurism, still it would be certain, that by means of pressure, applied above the seat of the disease, several cures have been accomplished; and if the compressing apparatus does not always produce such good effects, it is often because we have not the opportunity of making the pressure with sufficient steadiness and force to obliterate the artery. Compression (says Scarpa) generally answers very well when made upon an exposed artery, behind which there is a point of resistance. Formy,‡ in a wound of the brachial artery, laid bare the vessel, placed a cylinder of linen upon it, and over this some graduated compresses, supported by means of a suitable bandage; and thus he effected the closure of the artery.§ Guattani exposed the femoral artery as it passes under Poupart's ligament, compressed it against the ramus of the os pubis with graduated little bolsters and a bandage, and the vessel was speedily closed. Flajani,|| in similar cases, found the same method answer. Buzani¶ also succeeded with graduated compresses in healing a wound of the brachial artery, after bleeding; and so did Garneri in

* Leveillé Nouvelle Doctrine Chir. t. iv. pp. 247—280.

† Manuale di Chirurgia.

‡ Traité Chir. des Bandes Larges Emplâtres, &c. Montpellier, 1652.

§ De Aneurysmate, Historia 15.

|| Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. p. 47, &c.

¶ Opere di Bertrandi. Trattato dell Operaz. t. iii. p. 207. Gli editori.

two additional examples of the same nature. Scarpa corroborates the purport of these observations by a relation of some experiments, in which the arteries of sheep and other quadrupeds were tied with a simple ligature, and also with a ligature between which and the vessels a roll of waxed linen was placed, in order to prevent the inner coats from being cut through. The main result was, that, in all these cases, the artery closed, but the ulceration advanced more quickly in the instances where the simple ligature was used.* Four cases are likewise recorded, in which Scarpa's mode of applying the ligature was successfully practised in operations for aneurism. Some other experiments, performed by Mislei, and introduced at the conclusion of Scarpa's memoir, I shall notice in the chapter on aneurism, to the treatment of which disease they more particularly refer.

The foregoing considerations cannot allow us to hesitate a moment about the rejection of Dr. Jones's assertion, that a ligature will never be followed by an efficient degree of adhesive inflammation within a tied artery, unless the inner coats of the vessel be divided by the cord. Instead of this sweeping inference, Dr. Jones should merely have concluded, that such inflammation may take place, after the ligature has had the effect described, and not that it cannot happen under any other circumstances. The determination of this question, however, is not at all a decision of the other point, viz. whether such division of the inner coats of an artery by the ligature be useful, or detrimental, in its effects upon the process, by which the vessel is to be obliterated. This is an investigation of greater difficulty, and one, concerning which very opposite sentiments prevail.

Dr. Jones, who considered such division as the best means of promoting the effusion of coagulating lymph within the vessel, and as the surest and most prompt mode of bringing about the union and closure of the tied part of the arterial canal, gave a decided preference to small ligatures, which always cut through the inner coats of the vessel with the greatest certainty.

He thinks, that ligatures should be round, and very firm; and he declares, that there is no danger of their making the external coat of the artery ulcerate, by their tightness, before the internal ones have adhered; for the union of the latter is found to be soon effected.

Dr. Jones reprobates broad, flat ligatures, because they can-

* *Memoria sulla Legatura*, &c. pp. 27. 34, &c.

not be tied smoothly round the artery, which must become puckered, and, consequently, have an irregular bruised wound made in its middle and internal coats. By covering a considerable part of the external surface of the artery, they may also destroy the very vessels which pass on it in their way to the cut surfaces of the internal and middle coats, and thereby render them incapable of inflaming. But, says Dr. Jones, admitting that such a ligature makes a proper wound, and that the wound unites, still it may cover that part of the external coat which is directly over the newly united part, and, consequently, as soon as it has occasioned ulceration through the external coat, it will produce the same effect on the newly united parts, and of course, secondary hemorrhage.

A ligature of an irregular form will not cut through the inner coats of the artery equally at every point, which Dr. Jones endeavours to prove ought to be done, with a view of occasioning an effusion of lymph, and adhesion.

Dr. Jones has also explained the advantages of applying ligatures in as circular a manner as possible; not higher on one side of the vessel than the other. Any deviation from a circle must be unfavourable to a steady apposition of the cut surfaces of the artery, and be conducive to secondary hemorrhage.

Mr. Crampton, however, is far from admitting the utility of cutting through the internal coats of the artery with the ligature, and is of opinion, that, in man, the division of these coats not unfrequently prevents the obliteration of the artery, and gives rise to secondary hemorrhage; two assertions which appear to me not to be very well proved. If it be meant to draw a weighty argument from the weakening of the artery by this effect of the ligature, and an apprehension of the vessel bursting, or becoming dilated, how can we give such importance to this mode of reasoning, when such inability of the remaining external coat to resist the impetus of the circulation must be very rare? Although the two middle coats are divided by the ligature in securing the vessels in the common way after every operation, I have never seen an artery give way, or become dilated from this sort of cause. I have known the ligature slip from not having been skilfully applied; I have known it accidentally pulled off by a jerk of the hand, and hemorrhage take place. I can even suppose, that an artery may be so forcibly tied as actually to produce a direct laceration of the external coat; but then the cause would rather be owing to the operator himself, than to any fault of his ligature. An artery may also be in so diseased a state as to give way at once under the application of the ligature; or

if it should not burst so immediately, yet from being incapable of the adhesive inflammation, it may afterwards pour out its blood as soon as the ligature has produced ulceration through the external coat. But, in this circumstance, it is evident, as Scarpa himself allows,* that no mode of tying the vessel will answer. As we are not sufficiently acquainted with the actual state of the vessels, the kind of ligatures employed, and some other essential particulars, in the few cases cited by Mr. Crampton, with a view of proving the risk of arteries giving way from their inner coats being cut through by the cord, we cannot pronounce whether these were really examples of this injurious operation of the ligature; or whether they might not rather be specimens of some uncommon diseased state of the arteries. For my own part, I cannot suppose any instance, in which the brachial artery, after being tied in amputation, would three times form an aneurismal tumor above the ligature† if it were not in some unusual state of disease, because I have seen hundreds of amputations, but have never witnessed such an occurrence. Besides, if this particular case prove any thing, it proves, at all events, that the largish ligatures used in Mr. Warner's time, which ligatures probably never fairly divided the inner coats of a sound artery, could not prevent the vessel in question from giving way. Without extending these criticisms, however, I may safely assert, that the advocates for the utility of cutting through the inner coats of the vessel, and the employment of small fine ligatures, will come off triumphantly, if they only encounter such objections as are founded upon the danger of the artery at once giving way, or forming an aneurismal tumor. It avails little to talk, as Scarpa has done, of the arteries of some individuals being of preternaturally weak texture from birth,‡ or to urge with Mr. C. Bell, that, if a dead artery be tied too tightly, it will burst at the tied part when distended with anatomical§ injection. The question can never be decided by such statements; and when we admit with these writers, that an artery with three unbroken coats is physically stronger, than when two of these coats are broken, or torn, we still maintain, that the remaining external coat is strong enough to resist the impetus

* Memoria sulla Legatura delle Principali Arterie, p. 7.

† See Warner's Cases in Surgery, p. 138. Probably the inner coats of the artery were in this case not divided, because the vessel was secured with a needle and ligature, and of course an intervening portion of flesh included. Mr. Warner himself entitles the case "*An Extraordinary Disease of the Humeral Artery.*"

‡ Memoria sulla Legatura delle Principali Arterie degli Arti, p. 25.

§ Surgical Obs. vol. i. p. 260.

of the circulation, as far as we can judge from the general result of the practice, in which it is the surgeon's particular aim to cut through the inner coats of arteries in applying the ligature. It matters not what happens in the injection of dead bodies; what happens in aneurismal and diseased arteries before the ligature is employed; what may have happened in very unusual cases, showing that ligatures are not infallible; it must yet be proved, that the tying of arteries on the principles recommended by Dr. Jones, is generally less successful than other plans.

Amongst the many distinguished surgeons, who oppose the doctrines and practice recommended by Dr. Jones, and so extensively approved of in this country, is Scarpa, whose valuable observations on many parts of anatomy and surgery render him the pride of the modern Italian school. After briefly describing the process of obliteration, according to Dr. Jones's account, and mentioning a few other things, to which I have already adverted, he argues, that as cutting through the internal coats of an artery must render the vessel weaker than when its coats are left undivided, and we can never estimate the density of such a vessel in the living subject, it is, *cæteris paribus*, better to tie the vessel in such a way as will leave all its three coats uninjured. When the internal coat is ulcerated from internal causes, and the adhesive inflammation does not supervene quickly enough, he says, the blood is invariably effused through the layers of the middle tunic, and extravasated on the outside of it; first in the form of ecchymosis, and afterwards in that of an aneurismal swelling. Now, if this can happen, when only the inner coat is ulcerated, it must still more easily take place, when the middle coat is also divided, and any cause retards the adhesive inflammation. He admits that, even in this second case, if, directly after the division of the two internal coats, the artery is affected with the requisite degree of adhesive inflammation, as fortunately mostly happens, the union and closure of the vessel follow as speedily and favourably as if the two inner coats had not been divided. But he declares, that this fortunate issue is not constant, especially in man, in whom the adhesive inflammation is not, as it is in brutes, sufficiently quick to produce on the coats of the artery its beneficial effects, immediately after the application of a tight ligature. Yet while the adhesive inflammation is thus retarded, the ulcerative process occasioned by the pressure of the small ligature, rapidly attacks the external cellular coat of the artery, eats more and more deeply into it, and penetrates into the cavity of the vessel before this has been rendered impervious, and certainly with greater celerity,

than if it had to make its way through all the three tunics of which the artery is composed. The slow access of the adhesive inflammation, whether from the general debility of the patient, or from the particular state of the artery itself, is not followed by a proportionate retardation of ulceration, which incessantly proceeds till it gives rise to the worst effects. Besides, if in feeble subjects the adhesive inflammation were not materially impeded, the coagulating lymph effused in the cavity of the artery, as well as the coagulum itself, sometimes does not acquire with equal celerity the degree of consistence necessary for firmly connecting together the opposite sides of the artery, which are held in accurate contact. These dangers, says Scarpa, are unquestionably avoided by keeping all the three coats of the tied artery from being injured by the pressure of the ligature.*

But, after all this reasoning, we must return to experience; and if Mr. Crampton and Professor Scarpa have produced cases, exemplifying the possibility of effecting the obliteration of arteries, without a division of the inner coats of the vessels, as I admit has been fully proved, they cannot subvert the fact, acknowledged by all the most experienced surgeons in this metropolis, that since Dr. Jones's principles have been acted upon in practice, and small ligatures been employed for securing bleeding and aneurismal arteries, cases of secondary hemorrhage have become much less common. Those principles dictate the use of a fine ligature, and prohibit all unnecessary disturbance and irritation of the artery; all needless separation of it from its surrounding connexions; and, in particular, forbid the introduction of a larger quantity of extraneous substances into the wound, than the indications positively require. If the increased success, to which I have alluded, be the truth, it is an answer to every argument used by the opponents of Dr. Jones's principles. With respect to the danger of the external coat being ulcerated through more quickly by a ligature, which divides the other two coats, as this occurrence will enable the surgeon to remove the extraneous substance sooner, it must be a great advantage, if it be also a fact, as experience proves, that such division of the inner coats expedites the adhesive inflammation, and ensures the closure of the vessel, before the ulceration has penetrated through the external tunic.

Dr. Jones refutes the idea of the impulse of the circulation making the ligature slip off; a fear which has led to very

* *Memoria sulla Legatura delle Principali Arterie*, pp. 26-28.

hurtful practices; with the view of mechanically fixing the ligature; and he observes, that a candid inquirer into the cause of it will find a much more rational explanation, either in the clumsiness of the ligature, which prevented its lying compactly and securely round the artery; or in its not having been applied tight enough, lest it should cut through the coats of the artery too soon, or in its having that very insecure hold of the vessel, which the deviation from the circular application must necessarily occasion.

No other plan of preventing bleeding from large arteries is so safe as the ligature, because no other makes such direct pressure on them, nor acts with so little chance of being displaced. In the performance of operations, large arteries are often wounded in situations, where the tourniquet cannot be applied. The scientific surgeon now knows that he can tie such vessels immediately they are wounded, and then proceed with his incisions, without that confusion and danger which would result from the continuance of a profuse hemorrhage during the whole time requisite for the completion of the operation.

Good surgeons always endeavour to tie arteries as separately as possible, that is to say, without any nerve, vein, or portion of flesh, being included in the noose of the ligature. The tying of the flesh should constantly be avoided when possible, because it produces immense pain, and causes a larger part of the wound to remain disunited. Ligatures, thus awkwardly applied, are likely to become loose, as soon as the substance between them and the arteries sloughs; or they may form a circular furrow in the flesh surrounding the vessels, and remain a tedious time, incapable of being removed. The intervention of any substance, between the ligature and the artery, must also have a greater tendency to prevent the internal coats of the vessel from being cut through; that very event, on which the safety from secondary hemorrhage is found so much to depend.

Blood-vessels partake of the same organization as other parts. Hence the healing of a wounded artery can only take place favourably, when that part of the vessel, which is immediately contiguous to the ligature, continues to receive a due supply of blood through its vasa vasorum. As these vessels are derived from the surrounding ramifications, it is obvious, that the application of a ligature, to a divided artery, at some distance from where it is encompassed by flesh, must be very disadvantageous and insecure. Thus, although it is quite improper to include much of the adjacent flesh with the artery in the ligature, it is highly judicious to make the knot

as closely as possible to that part of the vessel which lies undisturbed among its natural connexions. These observations, however, only refer to vessels above a certain size; for others are not sufficiently visible to be tied in this manner.

The method of tying an artery is as follows; the extremity of the vessel is first to be taken hold of by the surgeon, with a tenaculum, or pair of artery forceps, which open by their own elasticity, and admit of being kept closely shut with a double button, that slides along a slit in each branch of the instrument. The forceps is used only when the vessel is large and obvious. A round firm ligature, and by no means too thick, is then to be put by an assistant, in the form of a noose, round the artery, just below the end of the instrument. The same assistant then tightens the noose; and, in order that it may not rise above the mouth of the artery, he draws the ends of the ligature as horizontally as possible, which can be done best with the thumbs. A knot is next made.* Assalini's very ingenious tenaculum would be found exceedingly useful in cases where the surgeon has no assistant at hand. See Fig. 1. Plate 1.

When the wounded artery is large, one ligature to the orifice nearest the heart frequently will not suffice; for, as soon as this is tied, the blood finds its way, through anastomosing branches, into the lower continuation of the vessel, the further orifice of which from the heart then begins to bleed.

When a large artery is only punctured, and not completely cut through, the vessel is to be first exposed by an incision, and a double ligature then to be put under it by means of an aneurism needle. One portion of the ligature is then to be applied above the wound in the artery, the other below it. Thus all danger of bleeding, from the blood's passage by the anastomoses into the lower part of the vessel is effectually removed.

Sometimes, when the punctured part of the artery cannot be prudently exposed by an incision, the surgeon should cut down to the vessel in a situation nearer the heart, and be content with the application of one ligature.†

Since ligatures act as extraneous substances, and only one half of each is necessary for withdrawing it when it becomes loose, the other half is always to be cut off near the knot.

* See NOTE G.

† In a gun-shot wound, injuring the popliteal artery, I once took up the femoral artery, and the plan answered very effectually; but the safest general rule is undoubtedly to expose the wounded part of an artery, and tie it above and below the aperture, from which the blood issues.

Fig 4.

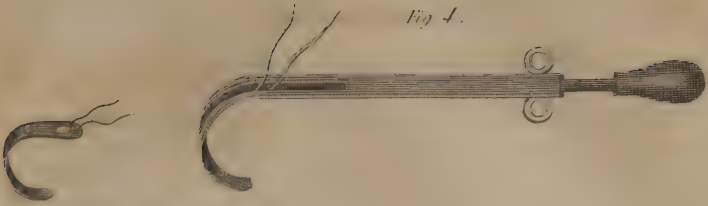


Fig 2.

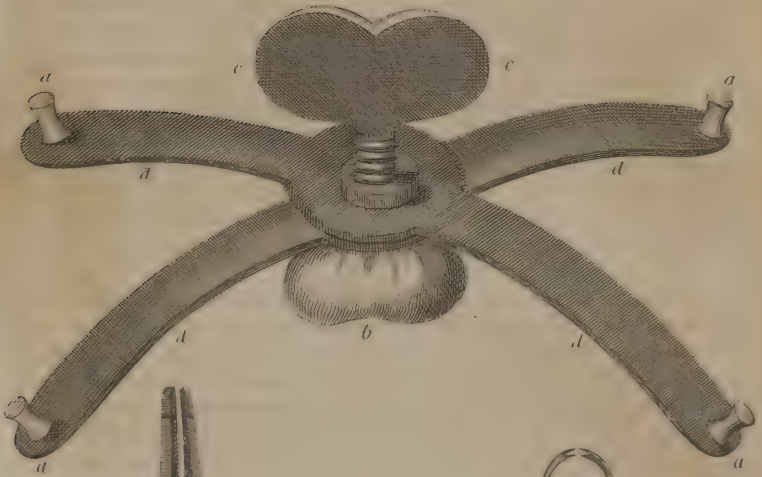


Fig 3.

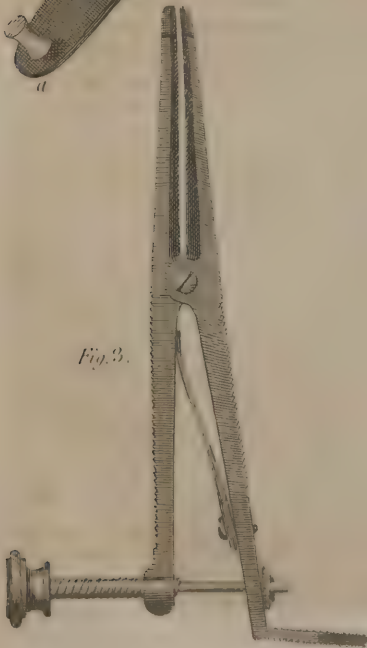
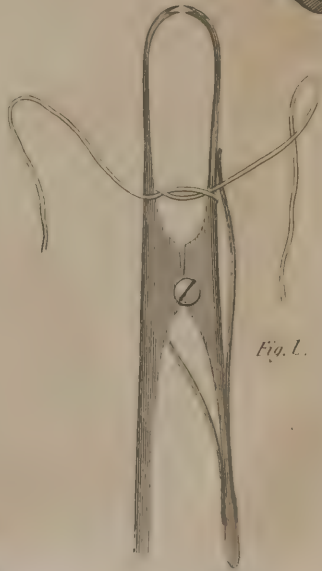


Fig. 1.



With the view of diminishing still further the quantity of extraneous substance in the wound, the practice of cutting off both ends of the ligature close to the knot has been of late years partially adopted. By some practitioners, the method is intended to be applied to all cases in which ligatures are used, whether the wound admit of being immediately closed or not. Others think the practice advantageous only when the wound must inevitably suppurate; and they express fears of the inconveniences that might arise from the presence of the little bits of thread, which would be left in the part, if the wound were to be healed over them by the first intention.* The peculiarity in Mr. Lawrence's method, who is an advocate for this practice, even when the wound is to be immediately closed, consists in the use of extremely fine ligatures, made of dentists' silk.† The bits of silk are not absorbed; but generally remain for a time without irritation in the parts, included in minute cysts formed by the adhesive inflammation, or, they afterwards come out by exciting little suppurations on the surface of the cutis; or, when the wound does not directly unite, they come away with the discharge.

Ligatures usually separate, even from the largest arteries ever tied, in about a fortnight, and from smaller ones in the course of five or six days. When they continue attached beyond the usual period, it is proper to draw or rather twist them very gently every time the wound is dressed, so as to accelerate their separation.

3. COMPRESSION.

Formerly surgeons used to fill the cavities of wounds with lint, and then make pressure on the bleeding vessels, by applying a tight roller over the part. The moderns understand too well the utility of not allowing any extraneous substance to intervene between the opposite surfaces of a recent wound, to persist in this practice, except in a very few instances. They know, that the sides of the wound may be brought into contact, and that compression may yet be adopted, so as both to restrain particular hemorrhages, and rather promote than retard the union of the wound. When the blood does not issue from any distinct, large vessels, but from numerous small

* Guthrie on Gun-shot Wounds of the Extremities, p. 93. See also Cross's Obs. in Lond. Med. Repository, vol. vii. 363, and Gibson's Institutes, &c. of Surgery, vol. i. p. 72.

† Medico-Chir. Trans. vol. viii. p. 490.

ones, compression is preferable to the ligature, the employment of which would render it necessary to tie the whole surface of the wound. In order to make effectual compression in this case, the opposite surfaces of the wound are to be brought into contact; compresses are then to be placed over it, and a roller applied with moderate tightness.

If compression can ever be safely practised in bleedings from large arteries, it is when these vessels run in the vicinity of a bone, against which they can be compressed. Bleedings from the radial and temporal arteries are cases of this kind. Compression is sometimes tried, when the brachial artery has been wounded in phlebotomy. Here it is occasionally tried, in preference to the ligature, because the latter cannot be employed without an operation to expose the artery. It is absurd to adopt compression, in this instance, with an idea that it effects a closure of the wound in the vessel without obliterating the arterial canal; and, consequently, with less chance of mortification from a deficiency of blood in the limb. Frequent dissections have proved, that whenever a large artery has been wounded and healed by pressure, the wound is never closed so as to leave the canal of the artery pervious. It is true, that Dr. Jones's experiments, as well as those of Beclard,* tend to show, that an artery, very partially divided, may heal and remain pervious; but this is not to be expected, when compression is employed.

When an artery of magnitude has received a small wound, and lies favourably for a trial of pressure, the following plan may be followed: I suppose the brachial artery to be the vessel.

A tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then a compress, shaped like a blunt cone, and formed of a series of compresses gradually increasing in size, is to be placed with its apex exactly over the wound in the artery. This graduated compress, as it is termed, is then to be bound on the part with a roller.†

After relaxing the tourniquet, if no blood escape, the surgeon should feel the pulse at the wrist, in order to ascertain that the compression employed is not so powerful, as entirely to prevent the circulation. The arm is to be kept perfectly quiet in a sling; and in forty-eight hours, if no bleeding take

* *Recherches et Expériences sur les Blessures des Artères.*

† See NOTE H.

place, there will be great reason to expect that the case will do well.

Plenk invented a tourniquet, well calculated to heal wounds of the brachial artery, and represented by Fig. 2, Plate 1. Leather straps are attached to the buttons, *a, a, a, a*, and are fastened behind the arm with buckles; one above, the other below the elbow. The pad *b*, is to be placed immediately over a graduated compress, which is to be put directly over the wound in the artery. The necessary degree of pressure may be regulated by the screw *c*; while the branches of the instrument, *d, d, d, d*, are at some distance from the limb, and consequently do not interrupt the flow of blood, either through the arteries or veins.

Compression of large arteries is never commendable, except in such a case as has been just mentioned, or when the wounded vessel is capable of being firmly compressed against an adjoining bone. The compresses sometimes slip off, or the bandages become slack, so as to give room for fatal hemorrhage. When the plan is employed, therefore, a slack tourniquet should always be left on the limb, ready to be tightened in an instant by a vigilant attendant left for that purpose. In this treatment, the external wound may heal, while the aperture in the artery remains unclosed, and an aneurism be the consequence, particularly if the pressure be not powerful enough; and when it is too great, mortification is liable to happen.

4. AGARIC,

Was formerly supposed to possess the virtue of stopping the most violent hemorrhage, without creating irritation. It has, however, no specific property of this kind; and whatever good effects it may seem to have had, are more properly ascribable to the compression adopted in conjunction with it. If it have any virtue at all, this is a mechanical one, arising from its soft, spongy texture, which qualifies it for filling up all inequalities in the wound, and thus closing the vessels. When it is considered that agaric is intended to be applied to the mouth of the bleeding vessel; and that, in this plan, the opposite surfaces of the wound cannot be brought into contact, we shall feel inclined to select some other means, not quite so repugnant to the union of the wound. Compression is often tried, because the vessel cannot be tied without an operation in order to expose it. But the employment of agaric is warranted by no such reason; for its fancied specific virtues require its application to be made directly to the divided

artery. Agaric has also the inconvenience of acting as an extraneous substance in the wound, and, like compresses, it is liable to slip off the precise situation which it ought to occupy.

When the wounded vessel is large, surgeons should always prefer the ligature to agaric; and when smaller vessels bleed, compression is far preferable to it.

These observations on agaric are also applicable to sponge. There are cases, however, in which it is impossible to tie, or compress the bleeding vessel; and improper to employ means which remain to be described. In bleedings from the rectum, and from the wound after lithotomy, the expanding quality of sponge often renders it exceedingly useful. The following means do not operate on the principle of pressure.

5. ACTUAL CAUTERY.

The application of a heated iron to a bleeding vessel is one of the most ancient modes of suppressing hemorrhage; but, at present, it is almost in general disuse. It operates by producing a slough, which covers and closes the mouth of the artery. In order that it may not injure the circumjacent parts, it is applied through a cannula.

There are several formidable objections to its employment: it does not regularly produce a permanent cessation of hemorrhage, as, when the eschar separates prematurely, the bleeding recurs. In many patients, the proposal excites horror; to all, the application is severely painful.

The only cases, in which the actual cautery is at all justifiable in modern practice, are hemorrhages situated in the mouth.*

6. POTENTIAL CAUTERY, OR CAUSTIC.

The most common formerly used, was a button of the sulphate of copper, of the size of a pea, rolled up in a piece of linen, and placed on the aperture of the bleeding vessel. The operation of strong caustics is similar to that of heated irons. Caustics are even worse than the actual cautery; for their action is more tedious, less effectual, and not confined to the vessel alone. In a case recorded by Pelletan, inflammation

* In Albert's *Nosologie Naturelle*, tom. i., is related an amputation of the tongue, where the bleeding from three large arteries was instantly and effectually stopped by touching them with the cautery.

of the dura mater and death were produced by muriate of antimony applied to a bleeding tumor on the head.*

7. STYPTICS, &c.

Styptics are alleged to have the property of producing a contraction of the vessels, and, as is sometimes erroneously supposed, a quick coagulation of the blood. Such are cold air, cold water, wine, brandy, tincture of myrrh, spirits in general, diluted mineral acids, solutions of alum, sulphate of copper, &c. These substances do, indeed, possess the power of stopping a few hemorrhages from small vessels; but they ought never to be trusted, when large arteries are concerned.

The method of applying fluid applications of this kind is to dip lint in them, and place it on the bleeding surface. Compression is generally adopted at the same time.

That cold air has a styptic effect, we have the most unequivocal proofs. We frequently tie on the surface of a wound, every artery that betrays a disposition to bleed, as long as the wound continues exposed to the air. We bring the opposite sides of this wound into contact, and put the patient to bed. Not an hour elapses before the renewal of hemorrhage compels us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. I have repeatedly seen this happen in the scrotum, after the removal of the testis. The proper conduct in such cases is not to open the wound unnecessarily; but to apply cold wet linen to the part, and keep up a continual evaporation from its surface, by which means its temperature will be reduced, and the bleeding suppressed.

All styptics create great irritation in recent wounds, in which cases, therefore, scientific surgeons never have recourse to them. They are, however, judiciously used to suppress bleedings from many diseased surfaces, where the vessels seem to have lost their natural disposition to contract.

When an artery is partly cut through, it generally bleeds more profusely, than when quite divided, because it can neither shrink under the surrounding substance, nor contract itself sufficiently to become impervious. Hence originated the advice to divide some wounded arteries completely through. This plan, however, ought seldom to be practised; for, if the artery is large, a ligature must, after all, be applied both

* Clinique Chirurgicale, tom. ii. p. 304.

above and below the wound ; and though it may answer when the vessel is of a moderate size, compression is safer. Were a large artery to be cut quite through, previously to the application of ligatures to it, its shrinking amongst the circumjacent parts would afterwards only increase the difficulty of tying it.

Sympathetic inflammatory fever, attended with an increase in the velocity of the circulating blood, and an augmented action of the heart and arteries, is the consequence of all considerable wounds. Hence, during its predominance, the patient is particularly exposed to the danger of fresh hemorrhage.

If the vessels be small, and the patient plethoric, venesection is sometimes recommended, the loss of venous blood being less prejudicial to the constitution than that of arterial. The flow of blood into the wounded limb is to be decreased by placing the part (if possible) in an elevated posture. Sometimes cold applications, sometimes compression, may be advantageously tried ; while, in other instances, a tourniquet, so constructed as neither to stop the circulation in too great a degree, nor hinder the return of blood through the veins, would be exceedingly useful. If, however, the arteries should be above a certain size, and the hemorrhage still continue, the vessels must be exposed, and tied.*

Hemorrhages from external injuries seldom require internal means, which, if they were needed, possess but questionable virtue. However, keeping the patient in a cool situation, not covered with too many clothes ; enjoining him to avoid all motion and exertions, and allowing him only a very low diet, are undoubtedly means well calculated to lessen the chance of hemorrhage.

* { The improper use of styptics and compression in many cases of wounds of the smaller class of arteries, by exciting inflammatory action, often serve to promote rather than retard hemorrhage. Mr. Abernethy says, "there is abundant evidence to induce us to believe that very large arteries, having been divided, and ceasing to bleed from faintness, will not bleed again unless inflammatory action be induced. The exposure of the wounded part to the air, and the cooling of the surrounding skin by evaporation, have appeared to me the most efficient means of suppressing hemorrhage." "The distention of wounds by lint or other substances which entangle the blood, and thereby promote its coagulation, is a procedure likely to keep up the inflammatory action, and I have known a great number of instances of hemorrhage being kept up by the very means which were used to suppress it." }

CHAPTER XIV.

EXTRACTION OF FOREIGN BODIES FROM
WOUNDS; UNION BY THE FIRST
INTENTION, &c.

BESIDES hemorrhage, there is another circumstance which requires attention before the wound is dressed; namely, the removal of all extraneous substances from its surface. This is universally allowed to be an object of very material importance, because, if it be not fulfilled, the wound may be brought together as nicely, as accurately, and as skilfully as possible, and every thing look well at the beginning; yet, that desirable event, union by the first intention, will not follow, but, instead of it, a severe degree of pain, considerable swelling of the circumference of the injury, extensive redness, supuration, large abscesses, and even the worst consequence, sloughing. All these aggravated effects frequently arise from the irritation of foreign bodies in wounds; and, as an incised wound can generally be examined, at first with the utmost facility, and properly cleaned, without putting the patient to much pain, the neglect on the part of the surgeon becomes the more blameable. In other deep, narrow, or lacerated wounds, and in many gun-shot injuries, it is often difficult at first to ascertain whether there are extraneous substances in the flesh, or not; or when known to be there, their exact situation cannot always be determined; but, in open incised wounds, no such difficulty and obscurity prevail, and the surgeon who closes them, without having assured himself, that they are perfectly free from all extraneous matter, betrays either supine negligence, or an utter ignorance of his professional duty. It is true, an incised wound, made with a clean sharp instrument, which has not been broken, can have no foreign bodies in it; but very considerable and dangerous cuts are often produced by glass, china, &c., which break at the moment, and leave some of their fragments in the flesh. Sometimes, also, the weapon, with which the wound is made, is unclean, and sometimes, dirt, gravel, &c. get into the wound, in consequence of the patient falling upon the ground immediately he receives the injury. I shall merely repeat, that, as extraneous bodies create serious irritation in every kind of wound in which they happen to be, the surgeon should always direct his attention to their removal as soon as the bleeding is stopped.

Mr. Hunter believed that blood, retaining the living principle, and lying on the surface of a wound, was rather useful than otherwise, in promoting the reunion of the parts ; and it was his particular opinion that effused blood became hurtful to this process, only after being deprived of the living principle by long exposure, the effect of styptics, &c. Yet, this is a doctrine which is by no means sanctioned by the best modern surgeons, all of whom are quite convinced, that leaving any blood upon the surface of a recent wound, when its opposite surfaces are to be brought together, is highly disadvantageous, retarding the cure, and rendering union by the first intention less certain. The presence of blood must have the effect of producing a greater or lesser separation of the opposite surfaces, which strictly ought to touch each other.

UNION BY THE FIRST INTENTION.

When the surgeon has stopped the bleeding, removed extraneous substances, and properly cleaned the wound, the next indication is to bring the opposite sides of the injury evenly into contact, and keep them quietly and steadily in this position, until they have grown together. Wounds may be healed by two processes, viz. by one, in which pus is produced, and granulations and new skin are formed ; and by another, in which, if it perfectly succeed at every point, no supuration whatsoever takes place. Surgeons have termed this way of healing wounds *union by the first intention, or adhesion*, and Mr. Hunter named the process by which it, together with many other analogous effects, is accomplished in the animal body, the *adhesive inflammation*.

The great recommendations of union by the first intention, are, celerity of cure ; the hinderance of the pain and inflammation which would arise from the exposure of raw surfaces ; freedom from the inconveniences of suppuration ; the prevention of the deformity which would result from a large, irregular cicatrix ; and the greater permanency and soundness of the cure, as the part is covered by the old, original skin, which is invariably stronger, and less disposed to ulceration, than what is new.

The strong tendency which divided parts of the animal body have to grow together, when kept a certain time in contact with each other, is an important fact, of which the moderns have taken much more advantage than the ancients. In the treatment of ordinary injuries, the latter seem to have availed themselves little, or not at all, of this readiness of raw living surfaces to grow together ; and as we may see by

referring to Celsus, it was principally in making attempts to repair and improve the appearance of deformed and mutilated parts, that they applied their knowledge of the fact to practice. The moderns, however, (I speak more particularly of our countrymen,) have shown their high sense of the good purposes to which this tendency to adhesion in the animal body may be converted, by recommending and practising the immediate closure of every wound, for the keeping of which open there is not some very particular and specific reason. There are even circumstances on record, leaving no doubt of the fact, that it is not quite impossible for parts, entirely detached from the rest of the body, to become united again, if quickly replaced. One extraordinary case, generally quoted in confirmation of this statement, is that mentioned by Garengeot, where a soldier's nose was bit off, yet, on being immediately restored to its natural situation, it acquired there a permanent union.* Two other examples of the reunion of pieces of the nose, which were entirely cut off, are recorded by Fioraventi,† and Blegny;‡ and well authenticated cases of similar facts in relation to other parts, may be found in different publications.§ The celebrated experiments of Duhamel and Mr. Hunter, furnish also a mass of interesting evidence, completely displaying the possibility of reuniting some parts which have been recently severed from the rest of the body. It was proved by Mr. Hunter, that the testicles of a cock, when introduced into the abdomen of a hen, contracted a vascular connexion with the surface of the viscera, and lived; and that a sound tooth might be transplanted from its socket, and acquire an union in the alveolar process of another person. Lastly, he repeated Duhamel's experiment, he cut off the spurs of a young cock, and found that they might be made to unite to its comb, or that of another cock, and grow even to a larger size than natural, in such situations. The possibility of this species of union shows how strong the disposition of the surfaces of a fresh wound must be to grow together; particularly when it is reflected, that, in the foregoing instances, there can be, on one side, no assistance given to the union, as the separated part is hardly able to do more

* *Traité des Opérations*, t. iii. p. 55.

† *Secreti Medicinali*, 12mo. Venet. 1561.

‡ *Zodiacus Medico-Gallicus*, Mars, 1680.

§ Bossu, in *Journ. de Médecine*, t. xxxiii. Dr. W. Balfour's *Obs. on Adhesion*, with two Cases demonstrative of the Powers of Nature to reunite Parts which have been by Accident totally separated from the Animal System, 8vo. Edinb. 1814.

than preserve its own living principle, and (as Hunter expresses himself,) accept of the union.*

But, although this evidence is too strong to permit us to doubt the possibility of reuniting parts, which have been completely separated from the animal system, and in which the circulation of the blood has necessarily ceased for a time, it must not be dissembled, that attempts of this nature have generally failed. They are very successful, however, when the detached part still retains a partial and slight connexion with the rest of the body, by means of only a few fibres, or a little bit of skin : a circumstance that makes a very material difference. As Dr. Thomson† has said, many cases are upon record, and many more have been observed, in which parts have been reunited which were completely detached, with the exception of a very small portion of cutis, a portion so small, that it is not easy to conceive, that any effectual circulation could be carried on through it ; and he quotes from Arcæus an instance in which the nose, and most of the upper jaw, were so extensively separated, as to hang down upon the chin, and yet were afterwards reunited. A remarkable example of the same kind was published by Larrey,‡ one of whose assistants was actually about to cut through the connexion which was left, when he was interrupted by the Baron, who happened to be on the spot. The instances, in which the fingers, toes, nose, and ears have been entirely cut off, with the exception of a small bit of skin, and afterwards saved by adhesion, are so generally known, and frequently exemplified in practice, that it would be useless prolixity to dwell upon them.

The knowledge of the preceding facts cannot but prove useful in relation to surgery ; it raises our confidence in the powers of nature, under circumstances in which we should otherwise entirely despair ; and, with the precedents before us, we shall be induced to attempt the union of parts, and sometimes succeed, when the project would appear hopeless and absurd to any one uninformed of what has already happened in other similar cases.

In promoting union by the first intention, surgery is merely to officiate as the handmaid of nature. There are only two indications : the first is, to bring the edges of the wound accurately together, and keep them so : the other is, to endea-

* See Hunter on the Blood, &c. p. 208, and Duhamel in *Mém. de l'Acad. des Sciences*, 1746.

† *Lectures on Inflammation*, p. 243.

‡ *Mém. de Chir. Militaire*, t. iv. p. 20. 8vo. Paris, 1817.

vour to avert violent inflammation, by which the agglutination of the wound would certainly be prevented. The first object is accomplished by a proper position of the wounded part, and by the use of bandages, adhesive plaster, and sutures; the second is fulfilled by a strict observance of the antiphlogistic regimen, and particularly by avoiding every kind of motion and disturbance of the wound. The rest is the work of nature.

1. POSITION OF THE PART.

This is to be regulated on the principle of relaxing the wounded integuments and muscles. If the extensor muscles are injured, the joints which they move ought to be placed in an extended posture; if the flexor muscles are wounded, the limb is to be bent. When the integuments alone are cut, the same posture which relaxes the muscles situated immediately beneath the wound, also serves in general to relax the skin. In transverse wounds of muscular fibres, it is astonishing what immense effect a proper posture produces. This is never to be neglected, whatever may be the other means adopted.

2. BANDAGES.

Bandages may frequently contribute very essentially to keep the sides of the wounds duly in contact, as is strikingly illustrated in cases of harelip, where the opposite edges of the fissure may be brought forward so as to touch, and be maintained in this position by the simple use of compresses and a bandage. Such was the mode of treatment actually preferred by M. Louis; and were it not for the greater convenience and certainty of the twisted suture, it is the plan to which surgeons would yet have recourse.

The common uniting bandage can only be applied to wounds which take a direction corresponding to the length of the body, or limbs, and which are situated where a bandage can be used with convenience and effect. It consists of a double-headed roller, with a slit between the two heads, large enough to allow one head of the roller to pass through it with facility. The proper dressings having been put on, the surgeon is to take one head of the roller in each hand, and apply the bandage first to that part of the limb which is opposite the wound. One head of the roller is then to be brought round, so as to bring the split precisely over the breach of continuity. The other head is then to be brought round in the opposite direc-

tion, and passed through the fissure. The bandage is next to be drawn moderately tight, and its two heads being carried round the limb again, the same artifice is to be repeated. A sufficient number of turns of the roller must be made to cover the whole length of the wound. When the wound is deep, small longitudinal compresses are sometimes put under the roller, at a little distance from the edge of the wound.

As the uniting bandage can only be made use of for longitudinal wounds, which never have a considerable tendency to gape, nothing can be more absurd than the application of it with immoderate tightness. By this cruel and injudicious practice, many limbs and lives have been lost; for, if the bandage be very tight on its first application, what a dangerous constriction of the limb or part must follow, when the swelling, necessarily arising from the wound, has come on. It is thus, that insufferable pain and gangrenous mischief are frequently induced, when, if the part had been simply dressed, and left unconfined, every thing would have gone on most favourably. It is right to state, however, that modern surgeons are not partial to the uniting bandage, and I have no hesitation in saying, that it is a means which may be advantageously banished from practice. If it be true, that it brings the sides of deep wounds together better than adhesive plaster alone, and that it acts without the irritation arising from the application of resinous substances to the skin, it still has many inconveniences: its total concealment of the wound, its lying in irregular folds, so as to create an uneven cicatrix, the difficulty of undoing it, and some other serious objections, might be mentioned. These reasons have rendered its employment much less frequent than in former times, and, I may say, that its use in this country is now superseded by the preference universally and justly given either to a common roller or an eighteen-tailed bandage, in every sort of wound for which the old incarnative bandage, some years ago, used to be recommended.

3. ADHESIVE PLASTER.

It is erroneously set down in numerous surgical books, as being only applicable to superficial wounds of the skin. It is true, that it has no direct effect in bringing the edges of a deep, muscular wound together; but, let it be remembered, that while it proves effectual in maintaining the edges of the skin in contact, it presents no obstacle to the simultaneous adoption of a proper position, compresses, and bandages, means having more effect on the deeper part of the wound. It is also

an error to suppose, that adhesive plaster cannot be used in situations where hair grows, or where the application is apt to become moistened. If the part be well shaved, and perfectly dried at first, the plaster will not become loose so soon as to prove ineffectual.

It is generally applied in strips, between every two of which an interspace is recommended to be left, for the purpose of allowing the discharge to escape, in the event of any part of the wound not healing in the ready manner which is desirable. Therefore, to bring the edges of the wound effectually together, and, at the same time, to leave a little room for the exit of the discharge, are the leading objects to which we ought to attend in using adhesive plaster. Hence, when the strips are broad, it is not unfrequent to cut out an oval piece of each strip, just where it crosses the wound.

Adhesive plaster is of great use, even in those wounds in which it is impossible to bring the edges into contact: by bringing and retaining the edges near each other, the strips lessen the size of the wound, while they keep surfaces in contact which have a disposition to adhere: and ultimately, when the gradual elongation of the old skin begins to take place, they succeed in bringing the separated edges together.*

A pledget of simple cerate is often applied over the plasters: it is frequently preferable to dry lint, which sticks to them and the ligatures, and is more troublesome to remove.

4. SUTURES.

Of the numerous sutures used by the old surgeons, only four are now ever employed: viz. the *interrupted*, the *quill*, the *twisted*, and another one, named *gastroraphe*. The twisted suture will be spoken of in the chapter on the hare-lip, and *gastroraphe* will be noticed in that on wounds of the abdomen.

INTERRUPTED SUTURE.

When the bleeding has been suppressed, and all extraneous substances have been removed, the surgeon is to place the limb in such a posture, as shall enable him to bring the lips of the wound easily into contact. The needle, armed with a ligature, and having a curvature that forms the segment of a

* See Thomson on Inflammation, p. 293.

circle, is then to be introduced into the right lip of the wound, at a small distance from its edge, and is to be directed across the bottom of the wound, so as to come through the left lip from within outward. It is now to be cut off, and the ligature tied in a bow. These sutures should always be, at least, an inch from each other. At the same time, strips of adhesive plaster, and a bandage for the support of the part, are usually employed.

QUILL SUTURE.

Formerly, this means of uniting wounds was often practised, when the muscles were deeply wounded, on the supposition that it produced a more perfect support of every part of the wound, than could be effected with the preceding suture. The same kind of needle is used as for the interrupted suture; but it must be armed with a double ligature. When the double ligatures have been introduced through the lips of the wound, at as many places as its length may require, their ends are to be separated, and then tied in a bow over a piece of bougie or quill, placed along each lip of the wound.

Dionis first reprobated this suture, which is justly rejected by the moderns as an artifice of mere ingenuity, and no real utility. An account of its modifications, therefore, would be superfluous.

In the present schools of surgery, the use of sutures is less recommended than in former days. By the combined operation of position, adhesive plaster, and a bandage, almost all wounds are capable of being united as expeditiously, and well, as they could be, were sutures employed. In the cure of the harelip, and a few wounds of the face, and, perhaps, in the treatment of large wounds penetrating the abdomen, we must admit their utility. In wounds of the lips, the incessant and unavoidable motion of the parts; and, in those of the abdomen, the distention, arising from the viscera, and the danger of their being protruded, are reasons which, in these particular instances, may account for the advantages of sutures. But, in general, the promotion of union by the first intention cannot be set forth as a valid argument, in favour of the practice. Inflammation, above a very moderate pitch, always destroys every prospect of this nature, and occasions the secretion of pus, instead of the exudation of coagulating lymph. Sutures have fallen into disrepute, principally because they tend to increase inflammation. The new wounds which they make, their irritation as extraneous bodies, the forcible manner in which they drag the living parts together, and their incapa-

city, in general, to accomplish any useful purpose, which position, adhesive plaster, and bandages, cannot effect, are strong motives for reprobating their common application. In fact, it often happens, when sutures are employed, that considerable inflammation of the wound is the consequence, and its swollen edges evince marks of suppuration, unless soon relieved from the irritation of the ligatures. Frequently, in this kind of case, if the surgeon be sagacious enough to cut the ligatures, and remove them in time, suppuration may still be avoided. Extensive erysipelatous redness, uncommon pain, and severe nervous symptoms, will often be found to originate from the irritation of sutures.

Pibrac's remarks on this subject are highly worthy of consideration: after relating many convincing facts, he concludes with asking, what practice the partisans of sutures would adopt, were they necessitated, as they frequently are, to cut the ligatures, and remove them? Or, were they to find, as is often the case, that the ligatures had made their way through the lips of the wound, so as to leave them gaping? They would then never think of introducing new sutures, but would have recourse to a bandage, in order to unite the wound.* Both this gentleman and M. Louist urgently recommended the entire discontinuance of the practice, and their observations are accompanied by facts which must have considerable weight. Their arguments, I confess, made a deep impression upon myself; and if I cannot join in the sentiment, that sutures ought to be entirely abandoned, at all events, I believe that they are still a great deal too much used. Professor Thomson thinks sutures may be generally omitted, except in superficial wounds, which we wish to heal by the first intention, or in wounds where (as in those of the abdomen) it is necessary that the edges should not be allowed to separate from each other.† But hardly any two surgeons think exactly alike about the cases, in which sutures are truly beneficial or not. Thus, I do not admit that they ought to be used as frequently as the remarks of Dr. Thomson would warrant; and it seems to me, that the majority of superficial wounds, in which union by the first intention is indicated, so far from being examples in which sutures are necessary, are, of all cases, those which least require them. Were we to admit such as instances of

* Sur l'Abus des Sutures, in *Mém. de l'Acad. de Chirurgie*, tom. iii. 4to. or tom. ix. 12mo.

† See *Mémoire sur l'Opération du Bec-de-Lievre*, op. cit. tom. xii. p. 118. edit. 12mo.

‡ *Lectures on Inflammation*, p. 287.

the necessity for sutures, the practice would become as common again as ever it was in the less improved periods of surgical knowledge.

Such are the principal means for keeping the opposite surfaces of wounds in contact, until union has taken place. The first plasters and dressings should continue on the part at least three or four days, unless any disagreeable symptoms, as excessive pain, hemorrhage, &c. indicate the contrary. The cause of the severity of the pain should always duly be considered, and, if possible, removed : sometimes it is owing to the sutures ; sometimes to the immoderate tightness of the roller ; and, occasionally, to extraneous substances yet lodged in the wound.

When too much inflammation is apprehended, the bandage should never be tight ; and wetting it with cold water may be of use. Perfect quietude, and an antiphlogistic regimen, should be observed. The old plan of covering the dressings with thick woollen rollers, caps, and large masses of tow, has now gone very much out of fashion, as being inconsistent with those principles which are recognised by every scientific surgeon, as best calculated to avert and lessen inflammation.

When the first dressings are removed, the surgeon often finds union by the first intention accomplished only at certain points of the injury ; and the connexion even there still requiring further support. On the application of the second dressings, however, it is generally unnecessary to put on as many strips of adhesive plaster as were at first employed, and their number may be gradually lessened at each future dressing. The sutures, if there are any, should also be now withdrawn, as they can do no further good, and their continuance may excite irritation, and do harm. Throughout the rest of the treatment, also, the dressings should be light, simple, and unirritating.

I shall conclude this chapter with a few useful rules, which Professor Thomson recommends to be observed in the dressing and examination of wounds.

The first is, never to give the patient more pain from our modes of procedure, or methods of dressing, than is absolutely necessary for his present good or future security. For instance, we ought never to probe a wound, where probing can be of no use ; and we should be contented to remain ignorant of things, the knowledge of which would only gratify an idle curiosity.

Another good rule is to have all the fresh dressings perfectly ready, before the old ones are removed. A sponge and warm water, adhesive plaster, pledgets, lint, bandages, &c.

should all be at hand, and not left to be looked for at the very moment when they are wanted.

As in many instances the removal of the dressings, and the application of others, take up a considerable time, we ought carefully to reflect what position will be most easy to the patient, and, at the same time, most convenient to the surgeon.

When the bandage, adhesive plaster, and other dressings, have become hard and dry, and glued together, and to the surrounding skin, by blood, or other discharge from the wound, the surgeon should soften and loosen the applications by wetting them a sufficient length of time with warm water, which is to be pressed out of a sponge upon them, a basin being held below the part for the reception of the water as it falls off the dressings. This duty is of much importance in saving the patient from a great deal of agony, which the abrupt removal of the adherent dressings would produce.

In removing the dressings which are under the bandage, we should be careful that the ligatures are not entangled, and forcibly pulled away, so as to give severe pain, and create a risk of hemorrhage.

The strips of adhesive plaster should be removed by taking hold of their ends, each of which is to be drawn towards the wound. Were the plasters pulled off in the contrary direction, the edges of the wound would be liable to be torn asunder again, and the process of reunion at all events disturbed: neither should the plasters be pulled up, as by this proceeding the edges of the wound would be torn from the subjacent parts.

In large wounds, only a single strip, or at most two, should be off at a time, and the part, from which the plaster has been removed, having been carefully wiped with a sponge, and dried, is then to be supported with a fresh strip, before any more strips are taken off. As Dr. Thomson well observes, it is from inattention to this rule that wounds are daily torn open again at each dressing, merely by the weight of the parts.

The sides of the wound, particularly if it be large and deep, should always be supported by an assistant at the time of changing the dressings.

When there are several wounds, only one is to be opened and dressed at a time, so that all unnecessary exposure of the parts may be avoided.*

* See NOTE I.

At each dressing, care must be taken to prevent lodgments of matter, by placing the compresses and strips of plaster in the manner best calculated to press upon and obliterate any cavity, in which the pus has a tendency to accumulate.

The utmost attention should be paid to cleanliness, every thing filthy and offensive being removed from the ward as quickly as possible. Above all things, care must be taken not to let the matter touch the bed-clothes. In the military hospitals, the custom of laying a piece of oilskin under suppurating wounded parts, in order to keep the bed clean, is highly praiseworthy; for cleanliness is essential to the general health of the patients, and the favourable progress of wounds.

The frequency of dressing must be regulated by the quantity and quality of the discharge; by the situation of the injury; by the climate and season of the year; by the effects which the renewal of the dressing seems to produce; and by the feelings, and sometimes the wishes, of the patient.*



CHAPTER XV.

PROCESS BY WHICH THE WOUND IS UNITED.

WHEN the opposite sides of an incised wound are maintained in contact by the foregoing means, they soon become permanently connected together. The vessels of the wounded surface cease bleeding, and their extremities become impervious to the blood itself, but not to the coagulating lymph, which forms the general bond of union between living parts. This uniting medium is the primitive and most simple connexion that takes place between the two sides of a wound. In many cases, where the wound is closed before the hemorrhage has had time to cease, no doubt a coagulum of blood itself constitutes the first bond of union, and wounds must thus be frequently united through the medium of red blood. I have, however, already explained, that the best practical surgeons make the surface of the wound as free from blood as possible, before its opposite sides are brought together, because it is found, that union by the first intention more certainly follows

* Thomson on Inflammation, p. 294, &c.

this mode of proceeding. But, the reader is not to understand, that he is to defer bringing the sides of a wound together, until every little oozing of blood is at an end; for the long exposure of the wounded surface would be very injurious, and tend to defeat the grand object in view, direct adhesion, without suppuration.*

We have examples of an union, very similar to that by the first intention, in bones which have been fractured; in tendons which have been ruptured; and even sometimes in muscles which have been wholly or partially torn asunder, without any division having been produced in the skin which covers such parts. In the sudden and violent division of these textures, blood is always effused between the divided parts, and into the surrounding cellular membrane. When this extravasated blood is not very considerable in quantity, and when the parts from which it has been effused are not too severely injured, it is observed to be gradually absorbed, in proportion as the process of union advances. If the divided surfaces be examined a few hours after the accident, they will be found to be covered with coagulating lymph. This substance, indeed, appears to be effused very quickly after the injury. Professor Thomson found, that, in animals, a distinct layer of it was effused over their wounds in less than four hours.† But, says he, whatever may be the period at which it is first formed, it is now well ascertained, that, in healthy subjects, when fractured, torn, or ruptured surfaces, to which the external air has not been admitted, are properly covered with this layer of coagulating lymph, and kept in contact, they speedily coalesce, and that, by this lymph becoming a living intermedium, the continuity of the divided part is at length

* {Mr. Abernethy remarks, "of late, at Vienna, a mode of treating wounds has been adopted, which, so far as I have had an opportunity of observing its effects, deserves imitation. The wounded surface is left exposed for some time to the air, and bathed with water until it appears covered over with a glutinous deposition, which is seen to ooze out in distinct and separate masses, till at last the whole surface is glazed or covered with a kind of glue. When this has happened, there is no chance of hemorrhage occurring, and the sides are brought gently into apposition, and thus become agglutinated. This seems to me an excellent mode of accomplishing the union by the first intention."

"The *secret* method of treatment as it was called, (in France) consisted in sucking the blood from these wounds at either extremity, and thus causing their sides to be pressed into close contact by the weight of the atmosphere. Under this treatment, wounds, made by the thrust of a small sword, which traversed limbs, and even the cavity of the abdomen, have been known to unite by adhesion without the occurrence of inflammation."}

† On Inflammation, p. 209.

restored. Appearances, precisely similar to such as happen in divisions without communication with the external air, take place in simple incised wounds, the edges of which have been brought together before, or soon after the bleeding has ceased. If a wound of this kind be torn open soon after its reunion, the surfaces, which had been united, are seen covered with a substance resembling jelly, which is the coagulating lymph, or fibrin of the blood. By some it is supposed, as I have said, that this lymph is poured out from the smaller vessels which have been cut; but Professor Thomson inclines to the opinion, that it is chiefly, if not wholly, formed by the secreting action of the capillary vessels of the divided surfaces.*

The simple agglutination of the sides of a wound together, is what may be considered as taking place directly they have been brought into contact. The next step, in the process of union by the first intention, is the generation of vessels in the coagulating lymph, or blood; and this is soon followed by an intercourse between the vessels of the two sides of the wound. The manner in which the new vessels arise in the uniting medium, as well as the way in which the inosculation of the divided vessels happens, are at present only matters of conjecture. I have introduced almost as much as is known upon this abstruse subject in the chapter on inflammation. Mr. Hunter once conceived that blood and coagulating lymph, as long as they retained the living principle, possessed the faculty of generating vessels within themselves, quite independently of any adjoining surfaces; and in the growth of the chick, there are unquestionably some appearances in favour of this opinion. This doctrine, however, he is said to have renounced previously to his death, and to have adopted the belief, which is now daily gaining ground, that the new vessels are extensions from the old ones. Professor Thomson delivers the following statement; the coagulating lymph, soon after its exudation, becomes penetrated with blood-vessels, *which proceed from the divided surfaces*, appear to join in the process of reunion by open extremities, or, in other words, to inosculate with one another. The blood now circulates freely through the new-formed channels of communication established between the vessels, which penetrate the lymph effused upon the surfaces formerly divided; and the vessels which shoot into the lymph, often acquire in the course of a few hours a size which renders them capable of being inject-

ed. The precise manner, in which the vessels are extended into the coagulating lymph, is still unknown. It has not been positively settled, whether it is the divided vessels which penetrate the lymph. The extremities of the larger branches are closed with the effused lymph, and removed by means of it and their natural elasticity to a distance from each other. Dr. Thomson regards these circumstances as insurmountable bars to their immediate inosculation; and he remarks, that, if it be the closed vessels which are prolonged into the lymph, each small artery must obviously have its corresponding vein. But, says he, the inosculation, or direct union of the small blood-vessels from the opposite surfaces of the wound, however difficult to conceive or explain, is a truth undeniably established.* He then adverts to Duhamel's experiment, which fully proves, that in the reunion of parts which have been divided, the blood-vessels from the opposite surfaces inosculate directly, and do not merely pass one another. Duhamel broke the legs of six chickens, and, after the bones had reunited, he cut through about one-third of the soft parts, covering the callus, or new bone. When the wound had healed up, he divided another third part, and in the same manner the remaining third part, sparing neither blood-vessel, tendon, nor nerve. Only one of the six chickens survived these cruel operations; but, upon injecting the artery at the upper part of the thigh, the injection penetrated to the lowest part of the leg. "I cannot say (Duhamel remarks) whether the large vessels, filled by the injection, were dilated capillary vessels, or the large vessels of the leg, which had been reunited; but the experiment proves irrefragably the inosculation of the blood-vessels." Later observations than those of Duhamel (says Professor Thomson) have shown, that it is by the small vessels, and not by the larger trunks, that the inosculations are formed, by which the divided parts of a limb are supplied with blood; nor does he accede upon this point to the sentiment of Hunter, who conceived that he had certainly succeeded in observing inosculation on the tunica conjunctiva of the eye, the vessels of which are frequently divided by surgeons in cases of ophthalmy. He states, that the two ends of the cut vessel are seen to shrink; but, after a little while, they are perceived to unite, and the circulation is carried on again.†

The celerity with which the process of union by the first

* P. 212.

† On the Blood, p. 193.

intention is completed, is a circumstance that must excite the admiration of the philosophical surgeon. In the short space of seventy-two hours, the wound, produced by amputation of the thigh, is often securely united through its whole extent, without any suppuration, except just where the ligatures are situated. Incised wounds of a moderate size may, in general, be completely healed by this method in forty-eight hours. How different, then, is the surgery of the present day to that of half a century ago, when the bigoted prejudices of our ancestors deterred them from doing, not only what was most salutary, but most simple! The complicated business of accomplishing digestion, incarnation, and cicatrization, is now reduced to the easy duty of bringing the sides of a clean cut wound into contact, and maintaining them so until they have grown together.

As a modern surgical writer has observed, "there is no wound, in which we may not try with perfect safety to procure this adhesion; for nothing surely can be more kindly when applied to a wounded surface, than the opposite surface of the same wound: it has been but just separated from the opposite surface: it may immediately adhere to it: though it do not adhere, no harm is done: still the wound will suppurate as kindly, as freely, as if it had been dressed with dry lint, or some vulnerary balsam, or acrid ointment. If only a part suppurate, while one-half, perhaps, adheres, then half our business is done: and, in short, this simple way of immediately closing a wound is both natural and safe."* If I were to instance any one circumstance, in which I think the excellence of English surgery strikingly displayed, I should be inclined to cite our partiality to the mode of curing wounds by the first intention. M. Roux,† in his criticisms upon this part of our practice, may convince his readers how sincerely he believes what he says; for he actually fancies we have been, as it were, forced into the custom of healing up wounds as quickly as we can, because, unfortunately, in this country, we have not, as he conceives, a sufficiency of the requisite materials for dressing wounds, which are to heal by suppuration! But, I doubt whether he will be joined by any surgeons on this side of the channel in the belief, that it would be better to abandon the practice of adhesion altogether, than make it an exclusive method of treatment. He particularly men-

* Discourses on the Nature and Cure of Wounds, by John Bell, p. 14. edit. 3.

† *Parallèle de la Chirurgie Angloise avec la Chirurgie Française*, p. 117. et suiv. 8vo. Paris, 1815.

tions the wound after castration as unfit for this plan, because the edges cannot be easily put into a state of co-aptation, unless a considerable piece of the scrotum be cut away, and sutures be used ; and also because the closure of the wound is attended with a risk of a collection of blood taking place in its cavity, and nature is nearly as long in effecting a cure, when the sides of the wound have been brought together, as when they have not. But if the principle were to be admitted, that the possibility of bleeding within a wound is an adequate reason for filling it with charpie, and not attempting to heal it by the first intention, we ought to renounce this last beneficial practice in every instance, where the surface of the wound is extensive, and its cavity large, as after amputation, the removal of a breast, the extirpation of tumors, &c. But, even supposing the scrotum should sometimes become filled with coagulated blood, of which M. Roux is so much afraid, it may then be inquired, which of two patients would be the best circumstanced, one with the scrotum crammed with charpie, or another with the same part distended with coagulated blood ? Which will suffer least pain, have the most moderate suppuration, and get well in the shortest time ? If the answer to these problems be so doubtful, as not to admit of being readily delivered, surely we may be allowed to argue thus : that if, when the evil complained of by M. Roux does really occur, the patient is not decidedly worse off than when such disaster does not happen, but the particular treatment recommended by that gentleman is followed, how much better it must be to let the patient at all events have the chance of a considerable portion of the wound uniting ; for when this is accomplished, (to use Mr. John Bell's phrase,) half our business is done.

But, if any wound require more strongly than others the approximation of its edges, and to be healed, if possible, by adhesion, it seems to me, that it is the incision made in the Hunterian operation for aneurism. Here the wound should be closed to let the artery lie quietly amongst its natural connexions, undisturbed by the contact of any dressings, or other extraneous substances, by which the adhesion of its sides might be prevented, its ulceration induced, and secondary hemorrhage occasioned. But, extraordinary as it may appear, this is another example of our practice selected by M. Roux to illustrate our blind predilection for healing wounds by the first intention. The wonder ceases, however, when we find that he considers ligatures of reserve (*ligatures d'attente*) advisable means in operations for aneurism ; for they are undoubtedly awkward things in a wound which ought to be

healed as quickly as possible, and they put union by the first intention out of the question. But in London, where the inutility and dangers of these ligatures of reserve are well understood, a practice, which tends to abolish their use, will be welcomed, as bringing with it another high recommendation.



CHAPTER XVI.

PUNCTURED WOUNDS

ARE not only dangerous, on account of their frequently extending to a considerable depth, and injuring large blood-vessels, nerves, and viscera of importance, they are also dangerous, inasmuch as they frequently give rise to violent and extensive degrees of inflammation. It is not uncommon to see them followed by formidable collections of matter, especially when the instrument, with which they have been made, has penetrated deeply through an aponeurosis or fascia. The extension of inflammation along the continuous textures from the original seat of the puncture, and the formation of matter under the fasciæ, are two of the most remarkable local phenomena, which are particularly liable to arise from punctured wounds.* Stabs, and all other punctures, are not simple divisions of the fibres of the body: they are attended with more or less contusion and laceration. Hence, there is not the same readiness to unite, which we observe in wounds made with sharp cutting instruments; and when the weapon has entered deeply through ligamentous expansions, the inflammation excited often spreads very extensively, attended with most severe pain in the parts affected, great tension, swelling, and abscesses running under the fasciæ to an alarming extent. Violent symptomatic fever, and great agitation of the nervous system, indeed, often follow punctured wounds; effects, which have been attributed to the injury of the tendons, or nerves. This doctrine, however, is now nearly exploded. Surgeons

* Thomson, *Obs. made in the Military Hospitals in Belgium*, p. 29. 8vo. Edinb. 1816.

frequently see nerves of considerable size and large tendons wounded, without the occurrence of great constitutional disorder; therefore, it cannot be the mere injury of these parts which is the occasion of all the general indisposition.

More is to be feared, I think, from the frequent depth of a stab, or puncture; the roughness and violence with which the injury has been done; and the many different textures pierced; than from the circumstance of tendons, or nerves, happening to be wounded.* Amongst the worst kinds of ge-

* {In slight punctured wounds, the danger unquestionably depends upon the state of the system at the time of receiving the injury, the bad effects being particularly liable to follow in those, who are naturally of an irritable temperament, or whose occupations and habits are calculated to enervate the system. A slight wound through the skin under such circumstances, will occasionally be followed by severe pain and inflammation around the wound, and the course of the superficial absorbents may be traced by the red and inflamed lines upon the skin from the wound to the glands above; abscesses form on the course of the absorbent vessels, and in the glands themselves, accompanied by a high degree of constitutional irritation. The form of the wound, and the structure injured, as well as the introduction of morbid matter into the system, have been considered by many surgeons as the causes upon which the bad effects of punctured wounds depend. That these effects are not produced, however, by the absorption of morbid matter alone, after punctures, is proved by their having, in repeated instances, followed in wounds from clean instruments, as sewing needles, &c. and also among others by the well known cases related by Dr. Butter as occurring among the workmen of the Plymouth dock-yard. These fatal cases, caused by various mechanical injuries, were in every respect similar to those originating from wounds received in dissection. The application of acrid matter from a dead body, to wounded surfaces, among different individuals, produces different effects according to the peculiar constitution or state of health of each.—One person may suffer from the most aggravated form of constitutional irritation, local inflammation, and abscesses, whilst others, equally exposed to absorption of the same matter, shall escape, or only experience a mild grade of local inflammation. Mr. Abernethy remarks, "In these cases it is something amiss in the general health of the patient which leads to the establishment of irritative inflammation."

In the treatment of such cases, our object must be to sooth the irritation both local and general. The application of caustics, as recommended by surgeons to punctured wounds, and as so constantly employed by students in our dissecting rooms, we believe can have but little effect in preventing the inflammation in such constitutions, indeed we have seen this application followed by increase of local inflammation, and pain, and aggravation of all the general symptoms. Elevation of the part, with cooling applications, or fomentations and poultices to the inflamed parts, blisters, or leeches, on the course of the absorbents and glands, as the inflammation extends, with an early and free opening when matter has collected, form the principal part of our local treatment. Mild mercurials, followed by laxatives or cathartics, according to the strength of the patient, to remove the offensive discharges and restore the natural secretions of the digestive organs, are required. The antiphlogistic plan, from the commencement, in a majority of these cases, is to be pursued with caution; the symptoms of local inflammation are not to govern us alone; the general state of the system is particularly to be attended to. The inflammation is connected with a low and prostrated state, as

neral indisposition, more frequently following punctured, than other descriptions of wounds, is tetanus; a complication still oftener seen in warm climates, than in our own.

Punctured wounds are generally more dangerous and difficult to cure, than cuts and sabre wounds, though much depends upon the nature of the parts injured. When immense swelling and inflammation follow; large abscesses form; extensive erysipelatous redness comes on; a large artery, or important viscus is wounded, and blood, or other fluid extravasated; the case is undoubtedly of a serious and dangerous nature. The same remark may be made when tetanus, or violent symptomatic fever, and great agitation of the nervous system, complicate the injury.

In the treatment of punctured wounds, erroneous suppositions have commonly led to many serious abuses. The unlimited idea, that the severe consequences of most punctured wounds are in a great measure owing to the narrowness of their orifices, induced numerous surgeons to practise, indiscriminately, deep and extensive incisions, for the purpose of rendering their external communication considerably wider. To have constantly in view the conversion of such injuries into simple incised wounds, was always a maxim strongly insisted upon, and urged as the reason for such treatment. The doctrine even occasioned the frequent dilatation of punctured wounds by means of tents, a still more absurd and cruel practice.

Certainly, if the notion were true, that an important punctured wound, such as the stab of a bayonet, could be actually changed into a wound, partaking of the mild nature of an incision, by the mere enlargement of its orifice, the corresponding practice would be highly commendable, however painful. But the fact is otherwise; the rough violence done to the fibres of the body by the generality of stabs, is little likely to be suddenly removed by an enlargement of the wound. Nor can the distance, to which a punctured wound frequently penetrates, and the number and nature of the parts injured by it, be at all altered by such a proceeding. These, which

well as of general irritation, or is soon liable to become so. Such cases, every surgeon of experience must have seen, not only following wounds of this description, but various others, as wounds or operations on the eyes, &c. The pulse in such cases is small, quick, and irritable, and free depletion, especially by blood-letting, by producing greater debility, renders the system more irritable, and increases the local inflammation dependant upon it. Opiates are necessary to allay irritability, and tonics, as quinine, wine, porter, volatile alkali, or other stimulants, are to be given to prevent sinking in the latter stages. }

are the grand causes of the collections of matter, which often take place in the cases under consideration, must exist, whether the mouth and canal of the wound be enlarged or not. The time, when incisions are proper, is when there are arteries to be secured, foreign bodies to be removed, abscesses to be opened, or sinuses to be divided; and to make painful incisions, sooner than they can answer any end, is both injudicious and hurtful. They are sometimes rendered quite unnecessary by the union of the wound throughout its whole extent, without the least suppuration.

It is true, that making a free incision, in the early stage of these cases, seems a reasonable method of preventing the formation of sinuses, by preventing the confinement of matter, and, were sinuses an inevitable consequence of all punctured wounds, for which no incisions had been practised at the moment of their occurrence, it would undoubtedly be unpardonable to omit them. To many this may seem a fair reason for enlarging the mouth of a punctured wound. Fair, however, as it may appear, it is only superficially plausible, and a small degree of reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not form only where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way, in which the abscess communicates externally, so that the pus does not readily escape; or it may be the presence of some foreign body, or carious bone; or, lastly, it may be an indisposition of the inner surface of the abscess to form granulations, arising from its long duration, but removable by laying the cyst completely open. Thus it becomes manifest, that the occurrence of suppuration in punctured wounds is only followed by sinuses when the surgeon neglects to procure a free issue for the matter after its accumulation, or when he neglects to remove any extraneous bodies. But, as dilating the wound, at first, will only tend to augment the inflammation, and render the suppuration more extensive, it ought never to be practised in these cases, except for the direct objects, of giving free exit to matter already collected, and of being able to remove extraneous bodies palpably lodged. I shall once more repeat, that it is an erroneous idea, to suppose the narrowness of punctured wounds so principal a cause of the bad symptoms, with which they are often attended, that the treatment ought invariably to aim at its removal.

Recent punctured wounds have absurdly had the same plan of treatment applied to them as old and callous fistulæ. Setons and stimulating injections, which in the latter cases sometimes

act beneficially by exciting an inflammation, that is productive of the effusion of coagulating lymph, and of the granulating process, can never prove serviceable when the indication is to moderate an inflammation, disposed to rise too high. The counter-opening, which must be formed, in adopting the use of a seton, is also an objection; and though French authors have given us accounts of their having drawn setons across patients' chests, in cases of stabs, they would find some difficulty in making the practice seem unattended with harm, much less, productive of good. The candid and judicious surgical reader, should not always think a plan of treatment right, because the patient gets well; for, there is an essential difference between a cure, promoted by really useful means, and an escape, notwithstanding the employment of hurtful ones.

Why, however, should we mention the use of a seton? What good can possibly arise from it? Will it promote the discharge of foreign bodies if any are present? By occupying the external openings of the wound, will it not be more likely to prevent it? In fact, will it not itself act with all the inconveniences, and irritation, of an extraneous substance in the wound? Is it a likely means of diminishing the immoderate pain, swelling, and extensive suppuration, so often attending punctured wounds? It will undoubtedly prevent the external openings from healing too soon; but cannot this object be effected in a better way? If the surgeon observe to insinuate a piece of lint into the sinus, and pass a probe through its track once a day, the danger of its closing too soon will be removed.

The practice of enlarging punctured wounds by incisions, and of introducing setons, is often forbidden by the particular situation of these injuries.

From what has been already stated, the reader must be aware, that I do not follow the bulk of surgical writers in recommending the indiscriminate dilatation of the orifices of punctured wounds; nor the use of the knife, for the purpose of preventing mischief only expected and apprehended, but not certain of taking place. Whenever I have attended bayonet, or other punctured wounds, unattended with any particular complication, I have always observed nearly the same principles as are now so generally approved of in cases of gun-shot wounds. I have abstained from dilating the orifice of the injury, except when it was necessary, either to get at a bleeding artery in the first instance, or to give a freer egress to the discharge in a later stage of the case. I have given the preference to mild, simple, unirritating, and superficial

dressings. I have not placed much faith in the utility of enveloping the parts in a tight bandage; but, after applying the first superficial dressings, have usually covered the limb or part with linen wet with the *lotio plumbi acetatis*, or cold water. Whenever a roller was used, in the beginning of a case, it was not with the view of making pressure, but of retaining the dressings. The wound having been dressed, I then put in practice all such means as are generally deemed most efficient in preventing and diminishing inflammation; such as venesection, the exhibition of aperient saline medicines, low diet, &c. When the pain was severe, opiates were prescribed, and on the access of much inflammation and swelling, it was an invariable rule with me to be sure that the bandage was slack. On the whole, I believe, that the application of superficial dressings and cold washes is the best practice for the first twenty-four hours after the receipt of a punctured wound. But if, after this period, the pain should increase, and the swelling and tension become more and more considerable, the surgeon may then remove the linen and bandages, and apply from six to a dozen leeches to the neighbourhood of the wound. He may also substitute for the cold lotions the use of fomentations and emollient poultices, under which is to be laid over the orifice of the wound a small pledget of spermaceti cerate, or other simple ointment. The poultices and fomentations are to be renewed twice a day, and the leeches and venesection repeated if necessary.

Sometimes, under this treatment, the surgeon is agreeably surprised to find the consequent inflammation mild, and the wound united by the first intention. More frequently, however, in cases of deep stabs, the pain is intolerable; and the inflammatory symptoms run so high, as to leave no hope of avoiding suppuration. In this condition, an emollient poultice is the best local application; and, when the matter is formed, its discharge is to be procured, either by dilating the original wound, or by making one or more incisions in other places, as may seem most advantageous. In short, the treatment must then conform to the principles already noticed in the chapter on suppuration.

CHAPTER XVII.

CONTUSED AND LACERATED WOUNDS.

THE instruments, which have the effect of producing what is termed a *contusion*, are either of an ordinary description, such as a cudgel, a stone, &c. ; or they consist of balls, bullets, and other metallic bodies which are impelled into the flesh with immense velocity by the explosion of gunpowder. Indeed, a forcible collision of any blunt, obtuse, hard body, against parts of the living body, must contuse, and often at the same time wound them. Gun-shot wounds, strictly speaking, are only examples of severe contused wounds, though surgeons find it expedient generally to treat them as distinct and peculiar cases : and when it is recollected how many difficult, intricate, and momentous questions, the subject embraces, the necessity of considering it by itself is immediately manifest.

The blunt weapons, or obtuse hard substances, which being applied with violence to any part of the living body, bruise, rupture, and otherwise hurt the fibres and vessels, may produce two different species of injury. First, they may more or less forcibly compress and crush the parts, upon which they act, so as to disorder the texture of those organs which are situated under the integuments, without causing, however, any breach of continuity in the skin itself. This is the case, which is familiarly called a *bruise*, or *contusion*, of which one of the worst examples is seen in the effects of cannon-balls, which graze the surface of the body, and crush the muscles and other deep-seated parts, while the skin itself remains unbroken. Secondly, a hard blunt body violently striking against parts, may produce at once a solution of continuity, extending through the skin, and sometimes also through other textures : this kind of accident is what surgeons name a *contused wound*. The latter injury more commonly follows, when the surface of the contusing weapon is not very broad. The cases, which rank as simple contusions, I shall consider in another chapter.

The majority of wounds are attended with some degree of contusion. Those which are inflicted with the blunt edge of a sabre, or the obtuse point and wedge-like end of a bayonet, are as much contused as punctured ; and hence, like other contused wounds, they do not often admit of being united by the first intention. It must be confessed, indeed, that all our

endeavours to reunite the sides of a contused wound, however skilfully directed, generally fail. An agglutination of the parts at most only takes place at the bottom of the wound, in which situation the flesh has suffered less contusion, the violence having spent itself, as it were, upon those parts upon which it first operated. Hence, suppuration of the external portion of the wound is mostly unavoidable. Still, the attempt at reunion ought to be made; for, if only the bottom of the wound heal by the first intention, it is a great advantage gained, more especially, when the surface of a bone has been exposed, and uncovered by the injury. In bringing the sides of contused wounds nearer together, however, the surgeon is not to attempt to do it with the same closeness, and accuracy, as in the instance of an incised wound. The injured parts would not bear the pressure, or the means requisite for this purpose; and it may be laid down, as an established rule, that nothing is more hurtful in cases of contused wounds, than much pressure, either from strips of adhesive plaster, or from rollers. In these cases, sutures are also totally unjustifiable; and I think that I have seen several examples, in which a rash determination of the surgeon to close large contused wounds with stitches, tight strips of plaster, and bandages, had no inconsiderable share in bringing on the rapid and fatal gangrene which carried off the patients. When I say, therefore, that a contused wound ought to be closed, and that its opposite surfaces should be brought nearer together, in order that the chance of some part of the injury uniting by the first intention may be taken, I do not mean to recommend dragging the parts together by main force, or placing them in a state of constriction. On the contrary, I think, that they ought to be left quite unconfined, the adhesive plaster being used very sparingly, and so put on as rather to hold the loose parts nearer each other, than to press and draw them into contact. Nor should the wound be covered with much plaster, as one or two strips will suffice for the object in view, and a greater number would create irritation, besides hindering other better dressings from touching the raw surfaces. Merely a strip or two are to be applied to such points, as seem most advantageous, for lessening the exposed surfaces, and all constriction should be most carefully avoided. That the practice, here advised, may be followed by a beneficial result, is proved by daily experience; and theory would lead us to expect such good, when we remember that, by preventing the wound from gaping in the manner it would otherwise do, we not only afford an opportunity for parts of it to reunite, but at once diminish an inevitable cause of in-

flammation and suppuration, viz. the continued exposure of a raw surface. Contused and lacerated wounds not only differ from incised wounds in the circumstance of being more disposed to suppurate, and slough, and more difficult to heal by the first intention, they differ also in the particularity of not usually bleeding much: sometimes, not even when the largest arteries are lacerated, as must be the case when whole limbs are torn away, in consequence of becoming entangled in different kinds of machinery. This indisposition to hemorrhage is not altogether a favourable omen, because though the patient runs less chance of bleeding to death in these cases, than in cut wounds, yet the very circumstance of the large vessels not pouring out blood, evinces, that the violence, contusion, stretching, and other injury, done to the parts, in addition to the mere division of them, must have been excessively severe, and that the danger of the subsequent inflammation, suppuration, and sloughing of the parts, is more than a counterbalance to any advantage proceeding from the absence of hemorrhage.

In the records of surgery, no facts are more extraordinary, than those which have been published, at different periods, on the subject of whole limbs being torn away, not only without hemorrhage, but without any other fatal effects. The cases of limbs torn off, related by Cheselden, La Motte, Carmichael, Morand, and Gibson,* are some of the most remarkable.

All lacerated and contused wounds should be treated according to common antiphlogistic principles. When the injury is extensive, and attended with a great deal of contusion, venesection is to be practised, and any moderate oozing of blood from the surface of the wound may be promoted by the use of fomentations. With respect to dressings, they should always be of a mild unirritating quality. After lessening by a strip or two of adhesive plaster the exposed cavity of the wound, when this is large, and the surrounding skin loose, or detached from the subjacent parts, the wound may be covered with pledgets of the unguentum cetacei, over which should be laid an emollient poultice. The first dressings should not be removed for at least 24, or 36 hours. Afterwards, however, the dressings may be changed once, twice, and in bad cases, even thrice a day, for as soon as the sloughs begin to separate, and suppuration commences, the necessity of renewing the dressings and poultices more frequently is evident. In

* Institutes of Surgery, vol. i. p. 92. Philadelphia, 1824.

severe cases, fomentations may be used at the periods of dressing, as nothing will be found more effectual for the relief of the pain. The employment of leeches also should not be forgotten, as a valuable means of palliating inflammation. Professor Asalini,* of Milan, has particularly recommended the application of cold washes to contused wounds; and I believe the plan is decidedly useful in the first instance,† when it is a great object to check the increase of extravasated fluids in the surrounding parts. I think cold applications are also highly proper when contused wounds are disposed to bleed more than usual, and yet, no large vessel presents itself as the source of the hemorrhage. But, in other periods and states of these injuries, I prefer emollient dressings.

If, in lacerated and contused wounds, the surgeon is less frequently called upon, than in incised wounds, to take measures for stopping bleeding immediately after the accident, he finds greater occasion for attending to another important duty, imposed upon him in his professional attendance upon wounded persons in general: I allude to the early removal of all foreign bodies and extraneous substances. Cuts are usually made with clean sharp instruments; but contused and lacerated wounds often occur in a manner which renders them very likely to be complicated with the lodgment of extraneous matter.

With regard to lacerated wounds, the same practical remarks apply to them, which have been offered on the subject of contused wounds; but the prognosis is generally considered more unfavourable, and in warm climates, tetanus is a frequent consequence.

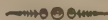
As soon as the surface of a contused or lacerated wound has thrown off its sloughs, suppurated, become clean, and evinced a tendency to form granulations, the poultices are to be discontinued, and simple dressings employed. The quality of these is afterwards to be altered, according to the future appearances of the sore; but, further directions, respecting the management of the case after it has arrived at this stage, will be found in the chapter on ulcers.

Some contused and lacerated wounds would be inevitably followed by a rapid mortification of the limb, and the patient run the greatest risk of losing his life, were amputation not performed immediately after the receipt of the injury. These are generally examples, in which the soft parts are extensive-

* *Manuale di Chirurgia*, 12mo. Milano, 1812.

† See NOTE K.

ly and deeply wounded, and large blood-vessels and nerves also injured. When mortification attacks patients so circumstanced, it is the gangrene which Larrey has called *traumatic*, and in which he and some other modern surgeons conceive, that amputation may often be done with success, though the mortification has not stopped. The treatment of lacerated and contused wounds, in a gangrenous or sloughing state, must be regulated by directions, given in the chapter on mortification.



CHAPTER XVIII.

OF GRANULATIONS AND CICATRIZATION.

GRANULATIONS are formed by an exudation of coagulating lymph from the vessels of the wounded or exposed surface. Into this substance new vessels extend, rendering it highly vascular. These vessels are described by Sir Astley Cooper as elongations of the vasa vasorum. According to Mr. Hunter, they pass from the original parts beneath to the bases of the granulations, and thence towards their external surface, in almost parallel lines. In other words, each artery, after having entered the base of the granulation, splits into many ramifications, which radiates to its surface. Granulations are also furnished with veins. They must be supplied with nerves and lymphatics; how tender they frequently are, every one knows; and it is equally well known, that medicines, applied to the surface of ulcers, sometimes find their way into the circulation, by means of absorption. According to Sir A. Cooper, the surfaces of old ulcers more readily absorb, than those of recent ones. He also states, that though granulations, springing from parts endued with great sensibility, are extremely sensitive; others, arising from an uninflamed bone, have no sensibility whatever, unless they proceed from the cancellated structure. Granulations from tendons and fasciæ, are likewise represented as possessing little or no sensibility.

Granulations have the same disposition to secrete pus, as the surface from which they are produced. They are very convex, having a great many points, or small eminences, so as to appear rough. The smaller these points are, the more healthy the granulations. The colour of healthy granulations is a deep

florid red. When of a livid colour, they are unhealthy; such appearance denoting that the circulation in them is languid. A depending position produces this livid hue, by retarding the return of blood: this is the reason, why some sore legs are so backward in healing, when the patients are allowed to stand and walk.

Granulations, when healthy, and situated on an exposed, or flat surface, rise nearly to the level of the surrounding skin, and often a little higher; but when they exceed this, and assume a growing disposition, they are unhealthy, becoming soft and spongy, and losing the power of producing new skin.

Healthy granulations are always prone to join with each other, and their vessels soon begin to inosculate: a fact, which, as Sir A. Cooper has justly remarked, in some measure accounts for the efficacy of circular strips of sticking plaster, which tend to bring the granulations into close contact with each other.

Granulations do not possess the powers of the original parts of the body; and consequently are very subject to mortify, or be absorbed.

It is by the foregoing process, that nature fills up the hollows of deep wounds, the edges of which cannot be brought into contact, and it is by the same steps that she succeeds in filling up the cavities of abscesses. The work, however, is not quite reducible to this simplicity. All modern practitioners observe, that as soon as the formation of granulations commences, the diameter of the wound becomes diminished from every two points of its circumference, even before any new skin appears to be formed. The natural elasticity of the skin, and the contraction of muscles, satisfactorily account for the separation of the edges of a wound. But how these edges become approximated, during the granulating process, is not so well understood. It has been said, that it arises from the diminution of the swelling which surrounds the wound. This is by no means a satisfactory explanation, because we know, that the separation of the edges proceeds from a different cause, and takes place prior to the swelling, and immediately on the occurrence of the wound. Mr. Hunter attributed the beneficial effect to a contraction of the granulations. He says, "the contraction takes place at every point, but principally from edge to edge, which brings the circumference of the sore towards the centre, so that the sore becomes smaller and smaller, although there is little or no new skin formed." This contraction of granulations takes place in a greater degree, and has a greater effect, when there is a looseness of the parts, on which

they are formed. When they are situated on parts naturally fixed, as the skull, shin, &c. the contraction is impeded.

The contraction of granulations is not confined to open wounds; it takes place in the cavities of abscesses, which by this means contract like the urinary bladder, till little or no cavity is left. When the granulations cannot contract further, if any cavity be remaining, it is obliterated by the growth of the opposite granulations into each other.

Besides the contractile power of the granulations, there is also a similar power in the surrounding edge of the cicatrizing skin.

As the granulations contract, the integuments extend over the part deprived of skin; not by being stretched, but as the consequence of what Mr. Hunter terms *interstitial growth*.

The contraction of granulations is one of the most beautiful examples, illustrating the wisdom with which the natural principles of the human body have been established. By it the formation of much new skin is rendered unnecessary; a great advantage, as original parts are much fitter for the purposes of life, than those which are new. By it, wounds, which, from neglect, have lost the opportunity of uniting by the adhesive inflammation, and others, which must necessarily heal in a more circuitous manner, are ultimately brought almost into the same state as if they had been united by the first intention. By this beneficial process, the cicatrix, compared with the original breadth of the wound, is often made as one to three.

After the whole wound is covered with skin, the remains of the granulations beneath it still continue to contract, till hardly any thing more is left than what the new skin stands upon. This is a very small part, in comparison, with the first formed granulations; and, in time, it loses more of its apparent vessels, and becomes white, and like ligament.

When a wound begins to heal by the granulating process, the surrounding old skin, near the granulations, no longer exhibits the glossy redness, about one-fourth or one-half of an inch in breadth, which it previously showed. The angular margin of the skin becomes converted into a roundish, smooth, and white boundary; and the nearer to the cicatrizing edge the whiter it is. This white substance Mr. Hunter suspected to be a beginning cuticle.

The new skin is a very different substance, with respect to texture, from the granulations upon which it is formed. It most commonly takes its rise from the adjacent old skin, as if elongated from it; but this is not regularly the case. I remember a workman in a laboratory who was dreadfully burnt

with ignited spirits over the greater part of his body, in consequence of which he had extensive sores, occupying nearly the whole surface of some of his limbs. When these ulcers had considerably diminished, the power of producing skin seemed to lessen at the edges, but, at the same time, new portions of skin made their appearance at various parts of the ulcers, standing (as Mr. Hunter ingeniously describes) upon the surface of the granulations like little islands. Mr. Hunter was of opinion, that this production of skin, in the centre of sores, never happened the first time of their being sores. In the patient just mentioned, whom I saw in Mr. Ramsden's private practice, and attended a long while, the contrary fact took place. Sir A. Cooper considers, that the centre of an ulcer has not the power of forming new skin, unless some portion or portions of the original skin should not have been completely destroyed. How far this observation will explain the fact, which presented itself to my notice, I cannot say ; but, it is an original remark, and worthy of future attention.

In general, the surrounding skin seems to communicate a disposition to the surfaces of the adjoining granulations to form skin ; just as bones give an ossifying disposition to granulations formed upon them.

The new-formed cutis is neither so yielding nor so elastic as the original. It is also less moveable, and destitute of the furrows observable on the old skin. At first, it is extremely full of vessels ; but, afterwards, both it and the subjacent granulations become less vascular, and therefore white. The surrounding old skin is puckered into loose folds, while the new constantly retains a stretched, shining appearance.

The production of cuticle, from the new cutis, is a much more easy process, than the generation of skin. The formation of skin is chiefly progressive from the surrounding cutis ; but the cuticle is frequently formed at once, and equally from every point of the cutis.

The rete mucosum is not so readily formed as the cuticle ; but, at length, it is produced ; for, in blacks, a cicatrix, which is at first reddish, after a little while turns even blacker than the original skin.

CHAPTER XIX.

GUN-SHOT WOUNDS

ARE produced by hard, obtuse, generally metallic bodies, like cannon balls, bullets, fragments of bomb-shells, &c. which being violently propelled by the force of exploded gunpowder, are driven into, or even quite through the injured parts. There are also some exceedingly severe gun-shot injuries, as we shall presently explain, in which the ball contuses and crushes the flesh, and sometimes breaks the bones themselves, while the integuments remain unbroken over all this concealed, and often unsuspected, mischief. Nothing can be more correct, than Mr. Hunter's observation, that the differences of gun-shot wounds are referrible to three principal causes, viz. the kind of body projected, the velocity of that body, and the nature of the parts injured.*

Former surgeons, seeing the terrible mischief frequently arising from gun-shot wounds, entertained a suspicion that the injured parts were either dreadfully burnt by the heat of the projected body, or were irritated by the presence of poison, as well as by mechanical violence. We learn from Paré, that when the king of France was besieging Turin, the besiegers and the besieged mutually believed, that their enemies had poisoned their balls, so cruel and intractable were the wounds; but after the taking of the city, the soldiers of both parties met, and then they saw that their own clean and unpoisoned balls had made these cruel wounds. The moderns, better acquainted with the laws of projectiles, and the component ingredients of gunpowder, rightly attribute the ill consequences of gun-shot wounds to the violence, contusion, and laceration, inflicted on the wounded parts. A ball, however great the rapidity of its motion, never acquires in its course any perceptible degree of heat; and that there is nothing poisonous in the composition of gunpowder, is now universally known. The circumstance of the violence being produced in general by so obtuse a body as a musket ball, and often done with immense velocity, is fully sufficient to account for the usual severe consequences of these injuries. Bullets are the most common bodies shot into the injured

* On the Blood, Inflammation, and Gun-shot Wounds, p. 523, 4to.

parts; but the wound may be produced by cannon balls, pieces of broken shells, and very often on board of ship by splinters of wood. Large bodies of irregular figure, must occasion a greater quantity of mischief than such as are externally smooth, of a round form, and of moderate size. Pieces of clothes are also frequently carried along with the ball into the wound.

Gun-shot wounds are always attended with contusion and laceration, by which, most commonly, some of the fibres around the track of the ball are deadened, and must be thrown off in the form of a slough, before the parts can heal. Hence, these cases rarely admit of being united by the adhesive inflammation, but must suppurate; and, on this same account, they seldom bleed profusely, except when very considerable blood-vessels are torn.

Besides the figure and magnitude of the body impelled into the living solids, the velocity with which it moves makes considerable difference. Hence, when a ball has passed with little velocity, (which is sometimes the case at its entrance, but more frequently near its exit), the wound may often be healed by the first intention. At the entrance of the ball, the circumference is usually depressed; at its exit, prominent; and, in numerous instances, the adjacent parts have a livid appearance. The opening which the ball makes in entering a limb, is always smaller than that by which it passes out again.

On account of the parts surrounding a gun-shot wound, being often deadened, the nature of the injury cannot always at first be comprehended. A part of some viscus, a large artery, or even a bone, may have been deadened by the violence; but the mischief does not manifest itself before the slough separates.

The detachment of the deadened parts is usually not accomplished till about the sixth, eighth, or tenth day, and sometimes not till about the fifteenth day, after the receipt of the injury; consequently, at these periods, there is the greatest danger of hemorrhage, extravasations of the contents of viscera, &c. The knowledge of these circumstances naturally suggests the propriety of letting the wound be most narrowly watched, at the falling off of the eschars, "for the blood often bursts out in the night, and, in the morning, the patient is found dead, bathed in his blood."*†

* John Bell, Discourses on the Nature and Cure of Wounds, p. 102, edit. 3.

† See NOTE L.

When a gun-shot wound only injures soft parts of ordinary importance, it is termed *simple*. When at the same time it fractures a bone, wounds a large artery, nerve, or important viscus, it is then called *compound*. The latter complications must greatly increase the danger of the accident, as any one may readily conceive, who knows the peril attending fractures, conjoined with a wound; the hazard of bleeding, or of mortification, when the main artery of a limb is injured; and the various consequences of wounds of the viscera, extravasations, &c.

The pain of gun-shot wounds is often inconsiderable, so that in many instances the wounded are not even conscious of having received any injury. If, however, the ball has touched a large nerve, the pain will be severe, and the power of the part lost. Some men will have a limb carried off, or shattered to pieces by a cannon ball, without exhibiting the slightest symptoms of mental or corporeal agitation; while a deadly paleness, instant vomiting, profuse perspiration, and universal tremor, will seize another on the receipt of a slight flesh wound.* The frequent absence of a general agitation of the system for a certain time, after the receipt of bad gun-shot wounds, I had many opportunities of noticing in the late campaigns in Holland and Belgium, where many a brave man was seen with a limb torn completely off, lying without any remarkable perturbation, and as quietly and composedly awaiting surgical assistance as if the accident had been only a slight injury. The most dreadful gun-shot wounds, in fact, sometimes happen, without bereaving the patient of his senses and presence of mind for a moment. A memorable proof of this truth was seen in a young sailor, who presented himself some years ago at St. Bartholomew's hospital. A cannon ball had struck him on the shoulder, and, besides severing the limb from the body, had broken away a large portion of the clavicle, and split the scapula into numerous fragments. Yet, even on this severe occasion, there was no syncope, no bleeding of consequence, and the senses were not suspended for an instant.

The form, the momentum, and the direction of the shot which is received; the position and the variety of structure, or, in other words, the variety of density, and powers of resistance, in the part receiving it; are the principal causes in-

* Hennen's Obs. on some Important Points in the Practice of Military Surgery, p. 31. 8vo. Edinb. 1818. A valuable work, the third edition of which is about to be published.

fluencing the course of the ball, in its passage through the substance of the body. Every new resistance, which a shot in motion meets with, operates so as to produce not only a diminution of its momentum, but, also, a change in its direction. By adverting to the above circumstances, the strange course which some balls take, running nearly all round the body beneath the skin, may be satisfactorily explained. Their track, when it is thus superficial, is generally indicated by what Mr. Hunter compares to a blush, or, as Dr. Hennen says, by a wheal or dusky line, terminated by a tumor, in which the ball is contained; and sometimes where this mark is absent, a certain emphysematous crackling shows the course of the bullet, and leads to its detection. Some very extraordinary instances of the reflection of balls, from one part of the body to another, are recorded by the preceding author. The ball (he observes) is in many instances found very close to its point of entrance, having nearly completed the circuit of the body. In one case, which occurred to a friend of his in the Mediterranean, the ball, which struck about the pomum Adami, was found lying in the very orifice of its entrance, having gone completely round the neck. This winding course of balls is represented as particularly frequent when they strike the ribs or abdominal muscles; for, says Dr. Hennen, they are turned from the direct line by a very slight resistance indeed, although they will sometimes run along a continued surface like that of a bone, a muscle, or a fascia, to a very extraordinary distance. It is surprising what a variety of parts may be injured by a musket ball, if there be nothing to check its course, and its momentum be very great. Dr. Hennen has seen cases where it traversed almost the whole extent of the body and extremities. In one instance, which occurred in a soldier with his arm extended, in the act of climbing up a scaling-ladder, a ball, which entered about the centre of the humerus, passed along it over the posterior part of the thorax, coursed along the abdominal muscles, passed deeply through the glutæi, and presented itself on the forepart of the middle of the opposite thigh. In another case, a ball, which struck the breast, lodged in the scrotum.*

It was formerly supposed, that a ball might injure parts of the body in two ways, viz. by actually striking them, and by passing close to them, without touching them at all. This last kind of injury was called a wind-contusion, and supposed to originate from the violent commotion produced in the air by

* Hennen, op. cit. p. 33.

the rapidity of the ball. It consists of a forcible bruising, and even comminution, of the soft and hard parts situated beneath the skin, which itself remains entire.

The above mode of explaining how this violence is occasioned, is too absurd to need a serious refutation. The slight disturbance of the air is too feeble to account for the degree of violence committed. The air, to which the ball must impart the greatest motion, is that which is directly before it ; and yet this does not do the smallest degree of violence to the parts surrounding the spot at which the ball enters. Cannon balls often strike limbs, without the neighbouring parts being in the least hurt. Pieces of soldiers and seamen's hats, feathers, clothes, and even hair, are frequently shot away, without any other mischief. These *wind-contusions*, as they have been improperly named, are now well known to be caused immediately by the ball itself ; and its occasioning a violent contusion, without wounding the skin, or entering the limb, is referrible to the sloping direction in which it first strikes the surface, and to its being reflected.

Surgeons ought to feel themselves under great obligation to Ambrose Paré, for the more accurate opinions, which he first introduced, concerning *wind-contusions*. But no man has exposed the absurdity of supposing that life may be extinguished by the "whiff and the wind of a ball," better than Mr. John Bell. "The reason of all these wonderful tales about the wind of a ball (says he) is itself very wonderful. Men often fall in the field of battle, and when the camp-followers come to turn over their bodies in burying the dead, no wound nor mark of injury is seen ; and often also men are laid in the military hospitals, dying and unable to speak, upon whom there is found no kind of wound, nor even the slightest bruise of the skin. Now this apparent difficulty will disappear, when I state (says Mr. John Bell) that a limb is often broken while the skin remains unhurt, and a dreadful fracture it is ; for when a great bullet strikes fairly, it knocks off the limb ; but when it strikes obliquely, it buffs along the skin, the ball is turned away, and the part struck becomes insensible at the instant ; there is no feeling of the terrible accident that has happened ; the patient is sensible of nothing more than a confused shock ; hardly knows where he is struck ; and falls down. This fracture is of the worst kind, for it is accompanied with such a bruising of the parts that they never can be restored ; and though the skin is still entire, there is much blood extravasated, the muscles are in an instant reduced to a gelatinous and pulpy mass, &c. Let a ball hit any of the great cavities thus obliquely, and this phenomenon appears ; the

patient is killed without any external wound. He is killed, according to the notion of his fellow-soldiers, by the wind of some great ball. But we know that the ball has actually struck him, that the breast, the belly, or the head, has been hurt. If the chest has been struck, then the ribs have perhaps yielded, and escaped the blow, but the lungs have suffered, and there is often blood extravasated in the chest. In the belly there is often a bursting of the liver, or spleen, without any outward wound of the skin; very frequently in the head, though there appears no outward injury, the pericranium is separated from the skull, and there is an effusion of blood upon the brain.”*

KINDS OF EXTRANEEOUS BODIES LODGED IN GUN-SHOT WOUNDS.

Extraneous bodies are more frequently met with in gun-shot wounds, than in any others. They are commonly of three sorts: 1. Pieces of clothes, or other substances, which the ball has driven into the flesh: 2. the ball itself: 3. or lastly, loose, splintered portions of bone. They are the cause of many bad symptoms: for they irritate the wounded parts so as to excite pain, inflammation, a disposition to hemorrhage, copious, and long-continued suppuration, &c., and the more uneven, pointed, and hard they are, the worse are their effects.

When there is only one opening, the surgeon has a right to conclude, that the ball is lodged; for I need scarcely lay down as exceptions to this observation, the very rare cases, in which the ball, after making a deep wound, is found in the patient's shirt. In these instances, the foreign body carries a piece of shirt with it into the part, without going through the linen, and when the latter is inadvertently drawn out, the ball is also extracted. An officer who wore a silk handkerchief in his breast, had several duplicatures of it actually carried into the pectoral muscle by the ball, which was afterwards drawn out with the handkerchief.†

When there are two apertures, we may infer, that the ball has passed out. However, pieces of the clothes may still be lodged in the wound; for, as they are lighter, and move with less impetus, than the shot itself, they must be more likely to be left behind.

* See John Bell's Discourses on the Nature and Cure of Wounds, pp. 175—177. Also, Larrey's *Mém. de Chir. Militaire*.

† Hennen's Military Surgery, p. 35.

In Dr. Hennen's publication, several very curious instances may be read, in which the foreign bodies were either of enormous size, or of an uncommon kind. A spent twelve-pound shot is there stated to have been found in the fleshy part of the thigh of an officer, who was killed at the siege of Seringapatam.* In another case, which happened in Belgium, a pantaloon pocket of coarse linen, containing two five-franc pieces and two small copper coins, was extracted from the substance of the vastus externus muscle.† In one still more curious instance, two five-franc pieces, and a Dutch stiver, closely beaten together, were extracted from the thigh of a soldier, who had no money about him previously to the injury, and who accounted for the situation of these coins, by supposing that they had been carried from the pocket of his comrade, who stood before him in the ranks, and who had been killed by the same shot.‡ A case is also detailed, in which several fragments of a cranium were taken from a lacerated wound of the thigh; and others, in which pieces of different bones, and even teeth, not belonging to the patients themselves, were found embedded in their flesh.

TREATMENT OF GUN-SHOT WOUNDS.

The first thing in the treatment of a gun-shot wound of one of the extremities, is to determine, whether it is more advisable to amputate the wounded limb immediately, or to undertake the cure of the injury.

When a bone, especially at a joint, is shattered into numerous fragments; when the soft parts are, at the same time, extensively contused and lacerated, with injury of important blood-vessels and nerves; and when at the same time the whole limb is thrown into a cold and insensible condition by the violence of the shock; no resource is so safe as amputation; and delay, under such circumstances, would lead to almost certain death.

Larrey says, when a body is projected from a cannon, and strikes a limb, so that the bones are fractured, and the soft parts violently contused, extensively torn and comminuted, amputation should be instantly performed. He recommends the same practice, when a large portion of the soft parts, and the principal vessels of a limb, are carried away by a ball, and the bone fractured. He represents the operation as equally

* Hennen's Military Surgery, p. 83.

† P. 87.

‡ P. 88.

indispensable when a large ball strikes the thick part of a limb, breaks the bone, cuts and tears the muscles, destroys the great nerves, and yet leaves the principal artery entire. When a spent or rebounding ball has struck a limb obliquely, without causing a solution of continuity in the skin, while the bones, muscles, tendons, and aponeuroses, are torn, broken, and crushed, Larrey thinks the following conduct proper: the extent of the injury must be ascertained, and if the bones be fractured under the soft parts, and there be ground to suspect, that the great vessels are lacerated, amputation should be performed. But, if the vessels and bones have been spared, and the muscles alone have been totally disorganized, he is content with the practice recommended in the Memoirs of the French Academy of Surgery, viz. that of making an incision, and letting out the thick, black, extravasated blood. Larrey then instances fractures of the articular heads of the bones of the knee and ankle by gun-shot, and the extensive denudation of a large portion of bone by a ball which has passed through the limb, as demanding immediate amputation. The latter case, however, is not quite so clear; for much must depend on the situation and quantity of injury inflicted. Perhaps the opinion given by another surgeon on this particular accident is more correct, namely, that where the ball is no larger than one projected from a musket, it is more advisable to wait and be governed by consequences.* I entirely differ, however, from the American surgeon who infers from one example, in which a patient recovered with a stiff joint, after being shot through the knee with a musket-ball, and from a few other rare escapes, that Larrey was wrong in pointing out such injuries as decided examples demanding immediate amputation. On the contrary, all the gun-shot injuries which I noticed abroad, that had been caused by the passage of balls through the knee-joint, fully confirmed the propriety of the general rule of amputating the limb thus injured. With respect to cut wounds of large joints, I allow with Mr. Mann, that they are not always cases positively demanding the immediate performance of the operation.

But below some of these violent degrees of injury, in which the necessity of immediate amputation can be readily and positively settled, there are several inferior degrees, in which the soundest judgment is required to form a prudent determination. In many of these cases, the scale is so deli-

* Mann's Medical Sketches of the Campaigns of 1812, 1813, 1814, &c. p. 210. 8vo. Dedham, 1816.

cately balanced, that an opinion is not to be formed from a consideration of the injury alone. In dubious cases, the patient's constitution, the possibility or impossibility of procuring good accommodation, rest, attendance, and pure air, are matters which ought to have weight.

Bilguer published an essay, in which the practice of amputation was condemned as an operation hardly ever proper.* The arguments, broached in this extraordinary production, however great their influence might once be, can no longer mislead any practitioner of common sense. In France the absurdities of Bilguer's work were long ago ably exposed by La Martinière;† and in England by Mr. Pott:‡ while more recently some judicious criticisms on his statements were drawn up and published by Mr. Guthrie,§ a gentleman whose evidence is valuable, as being founded upon the great opportunities of observation and comparison, of which he availed himself during the war in the Peninsula. Nothing is now better known and established than that, in many cases of bad gun-shot injuries of the limbs, the patient's only chance of preservation depends upon the performance of amputation.

Another question, that was not quite so well settled a few years ago as it is now, is at what time amputation should be done in cases of gun-shot wounds, where such operation is allowed to be indispensable. In 1756, the French Academy of Surgery conferred its approbation on a memoir written by M. Faure, who was an advocate for delaying the operation until the first bad symptoms were at an end. Mr. Hunter was in favour of the same practice. Upon the whole, however, reason, experience, and authority are strongly against delay. The immediate performance of the operation is urged by La Martinière, Le Dran, Ranby, Kirkland, Larrey, Guthrie, Hennen, Thomson,|| &c. Larrey's valuable works contain the most decisive facts in support of this practice; facts, drawn from extensive experience and a comparative trial of both methods,¶ while nothing can be more unequivocal and con-

* De Membrorum Amputatione rarissimè administrandâ aut quasi abrogandâ.

† Mém. de l'Acad. de Chir. tom. iv.

‡ Remarks on the Necessity, &c. of Amputation in certain Cases. Pott's Works, vol. iii.

§ On Gun-shot Wounds of the Extremities, &c. p. 7, &c. 8vo. Lond. 1815.

|| Report of Obs. made in the Military Hospitals in Belgium, with some Remarks upon Amputation, 8vo. Edinb. 1816.

¶ See *Rélation Historique et Chir. de l'Expédition de l'Armée d'Orient, en Egypte et en Syrie*; Par D. J. Larrey. Paris, 1803; and *Mém. de Chirurgie Militaire*, 4 tomes, 8vo. Paris, 1812—1817.

vincing, than the important cases and observations to be found in the practical writings of the other authors, to whom I have referred.

It is a doctrine, frequently inculcated in the schools, that a man who has been long habituated to disease, is more likely to bear an operation well, than another man, who is suddenly necessitated to part with his limb for an accidental injury. It would be quite unnecessary for me to assert, that there is no truth in this opinion, in relation to some of the operations performed in civil hospitals. What I saw during my apprenticeship, at St. Bartholomew's, left me with an impression, that amputations done immediately after accidental injuries, were generally less successful, than similar operations done for the removal of white swellings, and other chronic diseases. But, then, this has nothing to do with the question before us; for it does not prove any thing at all, with respect to the advantages or disadvantages of immediate amputation in bad accidental injuries, but, merely, that the amputation of a diseased joint generally terminates better than that of a shattered limb. We have still to inquire, whether, if the amputation had been delayed in such cases of badly shattered limbs, where confessedly there was no hope of saving them in the end, the operation would have had more extensive success. The question would then be more to the point; because gun-shot wounds rank as accidents. Now, as far as we can believe the testimony of the most experienced writers, especially that of Mr. Pott, we are bound to conclude, that the operation should be done, in every case of this kind, without the least delay. And, with respect to such gun-shot injuries of the limbs, as are decidedly fit cases for amputation, because no rational chance of saving the part can be entertained, Larrey, Guthrie, Hennen, Hutchison,* and all the latest and most experienced authors on military surgery, unanimously agree about the necessity either of the immediate, or very early performance of the operation. They further agree about the dangers of delay, and the infinitely greater number of recoveries following the speedy use of the knife. Respecting some little difference of sentiment on the point, viz. whether we should wait till the patient has revived a little from the first effects of the injury, or, (as the expression is,) whether the knife ought to follow the shot as speedily as possible, I believe, this is rather a seeming, than a real difference. No man would amputate while a man is lying in a state of depression and syncope,

* Some Practical Observations in Surgery, 8vo. Lond. 1816.

perhaps, with hardly any pulse, warmth, or animation. 'Here we must all coincide with Mr. Guthrie, that it is better to wait a little, and that to let the knife follow the shot would probably destroy the patient upon the operating table. But, should the patient not be thus dangerously depressed, then neither Mr. Guthrie, nor any other army surgeon, would think of proposing delay. With this understanding, therefore, I conceive the following passage to be judicious and correct: "If a soldier, at the end of two, four, or six hours, after the injury, has recovered from the general constitutional alarm occasioned by the blow, his pulse becomes regular and good, his stomach easy, he is less agitated, his countenance revives, and he begins to feel pain, stiffness, and uneasiness in the part; he will now undergo the operation with the greatest advantage, and, if he bears it well, of which there will be but little doubt, *he will recover in the proportion of nine cases out of ten in any operation on the upper extremity or below the middle of the thigh*, without any of the bad consequences usually mentioned by authors as following such amputations."* For all those injuries, in which amputation must absolutely be done, in order to give the patient the best chances, the practical and common maxim with army surgeons is, as Dr. Hennen observes, to proceed to the operation with as little delay as possible. While hundreds are waiting for the decision of the surgeon, he will never be at a loss to select individuals, who can safely and advantageously bear to be operated on, as quickly as himself and his assistants can offer their aid: but he will betray a miserable want of science indeed, if, in this crowd of sufferers, he indiscriminately amputates the weak, the terrified, the sinking, and the determined. While he is giving his aid to a few of the latter class, encouragement and a cordial will soon make a change in the state of the weakly, or the terrified.†

In all sudden injuries of the limbs, from great external violence, as gun-shot wounds of the extremities truly are, there are generally only two periods, at which amputation can be performed with much prospect of success. The first is immediately after the occurrence of the injury, before inflammation arises, and before a disposition to gangrene commences in the limb. This period only lasts a few hours; and, when these have elapsed, the dangers of mortification and death must be faced. With regard to amputating when the limb is univer-

* Guthrie on Gun-shot Wounds of the Extremities, p. 24.

† Obs. on several Important Points in Military Surgery, p 49.

sally swollen, and in a state approaching to gangrene, however favourably we may be disposed to think of the practice under circumstances noticed in the chapter on mortification, and when an earlier and better opportunity has been lost, we cannot then compare the chances of recovery to those, which might have been obtained by an earlier operation. On the contrary, in this late stage of the case, the patient's condition is desperate, whether amputation be done, or not.

If, however, these immediate perils should be got over, and the wound be brought into a state of suppuration, the violent inflammation and swelling abate, and, while the patient's strength yet remains adequate, the opportunity of amputating is once more afforded. But if the state of the patient is now not more favourable for an operation than it was directly, or soon after the accident, what has he gained but a great deal of avoidable pain and suffering? The necessity of the operation was acknowledged; its general success, when done early, is sufficiently proved; the second opportunity of doing it is frequently lost for ever by the patient's intervening death; and, if it should come, it brings not with it the same promise of recovery as the first did.

There are further reasons for preferring amputation to an attempt to preserve limbs, which have been severely shattered by gun-shot wounds.

1. By means of the operation, the patient gets rid of a dreadful contused wound, which threatens the greatest peril to his very existence, and exchanges it for a simple incised wound.

2. The pain of the operation is not, upon the whole, a greater severity, than the aggregate pain arising from the inflammation, irritation of extraneous bodies, and incisions for their evacuation and that of matter, in cases in which an effort is made to preserve the limb.

3. The loss of the limb ought not to be taken into the scale; for, the surgeon only amputates on the principle of saving the patient's life by that privation. When life is at stake, and it is more likely to be saved by the operation, than both life and the limb together without the operation, it is our duty to amputate. By this maxim, no doubt, a small proportion of limbs, which might be preserved, will be sacrificed, but the patient's life will be more frequently saved. Limbs, which are saved after these dreadful injuries, are also very often not more useful than a wooden leg; and the vigour of the constitution is sometimes irrecoverably lost, for a limb, which is rather a burden than a convenience.

Perhaps, in the army, surgeons may sometimes be justified

in amputating limbs, which it might be proper to endeavour to save, under all the advantages and conveniences of private practice. The necessity for the operation must evidently be greatly increased, when circumstances demand the patient's speedy removal from the field of battle to an hospital at a distance. The difficulty of conveyance; the bad accommodation in the military wagons, into which the wounded are crowded; the painful jolting, to which they are there subjected; and the way in which they are exposed to the inclemency of the weather; are all weighty reasons in favour of taking off the shattered limb. When the bones are broken and splintered, the sharp spiculæ are forced by the motion of the carriage still further into the flesh, and thus cause infinite suffering and vast additional mischief. Frequently, when the operation is put off, the disturbance of the parts in the journey so bruises and lacerates them, that the patient perishes in the most cruel agony, before he arrives at the hospital, which is intended for his reception.

As Larrey observes, the dangers of a long residence in an hospital are also much diminished by amputation, which converts a gun-shot wound into one which is capable of being speedily healed, and obviates the causes that produce hospital fever and gangrene. In case the wounded should be left on the field of battle, it is then important that amputation has been performed, because, when it is completed, they may remain several days without being dressed, and the dressings can afterwards be changed with greater facility.

When the upper part of the *os humeri* is fractured by a musket ball, the necessity for amputating the limb may frequently be obviated by making an incision down the centre of the deltoid muscle, and extracting the splintered head of the bone. The facts recorded by Boucher,* Vigaroux,† and Mr. C. White,‡ first exemplified the possibility of saving the whole arm by the excision of the upper portion of a diseased or shattered humerus; and the propriety of a similar proceeding in some gun-shot fractures of the upper part of that bone, has been well proved in Larrey's practice. In Egypt he superseded all occasion for amputating the limb, in no less than ten instances, by extracting without delay the head of the humerus and the fragments of bone; and, in his subsequent campaigns, the propriety of the practice was verified in a

* *Mém. de l'Acad. Royale de Chirurgie*, t. v. p. 302, &c.

† *Œuvres de Chirurgie Pratique*. Montpellier, 1812.

‡ *Cases in Surgery*, p. 57.

much larger number of examples. After the operation, the humerus is to be kept to the shoulder with a sling and a bandage. In one most remarkable and successful instance, the scapular end of the clavicle, the acromion, and the head of the humerus, were so broken to pieces, by the ball of a four-pounder, that the removal of all these parts was unavoidable. In some cases, an artificial joint is formed; in others, an ankylosis follows.* Mr. Mann assures us, that, in several dreadful lacerated wounds of the shoulder, he also saw the patients recover without amputation, care being taken to remove the splinters of bone.

In one case, the superincumbent muscles of the shoulder, with part of the subjacent, were destroyed, leaving a small portion in the axilla, connected with the principal artery, which received no injury. The acromion process and clavicle were fractured. The head of the humerus was broken, and four inches of the bone forced away by the ball, leaving an inch of its extreme head in the socket. Mr. Mann deemed amputation necessary to save the wounded officer's life; but the proposal was rejected. The fractured pieces of bones were removed, and by careful attention to the wound the arm was saved, so as to be of some use. Two other very interesting cases of a similar kind are also recorded, in which many splinters were extracted, pieces of the humerus sawn off, and some of the deadened portions of muscle cut away. The successful termination of these cases induces Mr. Mann to assert, that such will be the general result when the patient's health is good; and that the limb can be saved, with the small deformity of too sudden a sloping of the shoulder.† In a severe injury of the head and neck of the humerus, Mr. Guthrie thinks, that if the splintering extends to the body of the bone, amputation should be performed; if it be confined to the head and neck of the humerus, excision may be practised.‡ One would suppose, it must generally be better practice, rather to

* *Relation Historique et Chirurgicale de l'Armée d'Orient en Egypte et Syria*, p. 315.; and *Mém. de Chirurgie Militaire*.

† *Medical Sketches of the Campaigns of 1812, 1813, and 1814, &c.* pp. 208, 209.

‡ *On Gun-shot Wounds of the Extremities*, p. 248. I remember an artillery-man, at Merxam, near Antwerp, the greater part of whose shoulder was carried away by a 24-pound shot, and all the adjacent parts so broken and lacerated, that the lungs and pericardium were visible. The man, however, recovered without amputation. This case was also seen by the late Mr. Curtis, surgeon of the 1st guards, and by Sir Andrew Halliday, gentlemen then on duty with myself. The latter has given some account of it in the *Edinb. Med. and Surg. Journ.* vol. xi. p. 140.

be content with making a free incision through the deltoid, and extracting all the loose splinters of bone, than attempt the formal excision, or sawing off of the whole upper part of it; a proceeding which Mr. Guthrie* adduces cases to prove is not always necessary, even where the head of the bone is much shattered.

THE DILATATION OF GUN-SHOT WOUNDS, AND THE EXTRACTION OF FOREIGN BODIES, CONSIDERED.

When amputation was not deemed necessary, the old surgeons used, according to the customary precepts, to enlarge the aperture of the wound by an incision. Numerous advantages were alleged to result from such a dilatation: it was said to facilitate the extraction of foreign bodies; to occasion a beneficial effusion of blood; and to promote the escape of fluids extravasated in the surrounding cellular substance. Dilating the wound by an incision, was also absurdly supposed to convert the fistulous track of a ball into an open incised wound, and, thereby, render its nature more benign, while another good effect, supposed to result from the practice, was the division of unyielding parts, which confined, and thus aggravated the internal swelling.

More modern experience has clearly proved, that the utility of these incisions has been overrated. The knowledge, that gun-shot wounds are of various descriptions, ought at once to condemn the unlimited plan of dilating all of them. When the course of the ball lies in soft parts, and has neither touched a bone, nor a considerable blood-vessel, whether the wound have one or two openings, the scheme of dilating it is productive of no good. In gun-shot wounds, the aperture in the skin is at first generally wider than the orifice of punctured wounds and stabs; and by the separation of the sloughs, the diameter of the first class of injuries is rendered still larger, so that not only matter, but foreign bodies, often find a ready outlet. Incisions also usually soon close again, and the wound becomes, in a few days, in the same condition as if no dilatation had been made. Gun-shot wounds, therefore, are to be dilated, only when there is some plain and beneficial object to be accomplished by it.

No doubt, it is right to extract, at first, as many foreign bodies as possible; for, while they continue in the wound, they always exasperate the inflammatory symptoms, and some-

* On Gun-shot Wounds of the Extremities, p. 330, &c.

times create agitation of the whole nervous system. By an early extraction of them, profuse suppuration may often be prevented. Yet, let it be remembered, that the search for foreign bodies is frequently attended with great irritation of the wound; and that in numerous instances it is impossible to find and extract them immediately, as, for instance, when they are deeply, and firmly fixed in parts. When the wound is widened by the separation of sloughs, they generally become loose, and, on both accounts, their extraction may then be more easily performed. After having been deeply lodged, they sometimes spontaneously approach the surface, on the occurrence of suppuration. Lastly, it is to be observed, that foreign bodies, of smooth figure, have often remained, without the least inconvenience, in parts from which they could not possibly be extracted.

Hence, the surgeon acts wisely, who seeks at first to extract only such foreign bodies as are near the external opening, and loose, and removable without much irritation. When, however, they make pressure on an important part, a large artery, a considerable nerve, or important viscus, so as to create violent and dangerous symptoms from this cause, an incision is warrantable for their removal even when deeply lodged. If a large artery bleed, it is to be exposed and tied, as in other wounds. Sometimes when there is reason to expect a fracture of the skull, an incision may be judiciously made to examine the bone; that is to say, if there are symptoms leading to a suspicion that a part of the bone is depressed, and makes dangerous pressure on the brain. In this circumstance, it would not only be advisable to examine the state of the cranium, under the scalp, but even to remove such parts of the bone as are either splintered, or beaten inward. Depressed portions of the sternum and ribs may also require incisions.*

When the ball lodges in any of the large cavities, incisions are mostly improper, because the foreign body cannot be traced, and, therefore, they answer no direct purpose. When the ball enters far into the substance of a bone, the dilatation of the wound would also be of no utility.

But all that I have said upon this head is insufficient to guide the surgeon in every case. If the dilatation of the wound, for the purpose of extracting foreign bodies, should be less likely to aggravate the inflammation, than the pre-

* See Hunter on the Blood, Inflammation, and Gun-shot Wounds, p. 535, &c.

sence of those bodies, then it is highly judicious to put it in practice; but, in every case in which the ball cannot easily be discovered, one may safely decide to abandon all painful examinations. Experience shows, that its lodgment does not always give rise to bad symptoms. In some instances, the ball remains on the side of the limb opposite to its entrance, beneath the integuments. If the skin under which the ball is lodged, be contused in such a way, that it will probably slough, it is to be considered as a lifeless part, and an opening is to be made into it for the extraction of the ball. But when the ball lies so far from the skin that one can only just feel it, and the skin itself remains uninjured, Mr. Hunter disapproved of making a counter-opening. His experience taught him, that the wound healed much better when the ball was let alone, and that the chief inflammation was not in the vicinity of the foreign body, but about the mouth of the wound. In cases, in which a counter-opening had been made, Mr. Hunter noticed, that the same inflammation sometimes attacked it, which took place at the entrance of the ball. However, notwithstanding this high authority, I had many opportunities of seeing, while I was abroad, that the rule here inculcated was not followed. On the contrary, army surgeons of the present day always make it a maxim to extract the ball as soon as possible, when situated as above described. "The ball (says a late writer) will frequently have passed nearly through the limb, and be retained only by the elasticity of the common integuments. There we cut upon and extract it at once;" and he then recommends extracting on the spot every extraneous body that we possibly can, either with the forceps alone, or the aid of the bistoury.*

Screws, gimblets, and bullet-drawers, ought seldom to be used in extracting bullets. The fingers are commonly the most proper instruments; and, when forceps are judged more convenient, they should not be of a large clumsy construction.

Although one might judiciously omit an incision to extract a smooth round body, like a leaden bullet, one might not always act with equal judgment in doing so, when the extraneous body is of an angular figure, and large size, so as to be likely to cause immense irritation.

Detached splinters of bone are very irritating; and when their extraction can be accomplished, consistently with the above principles, it ought never to be neglected.

In gun-shot wounds, ligamentous bands sometimes com-

* Hennen's Obs. on some important Points in Military Surgery, p. 32.

press the subjacent tumefied parts; but, it is only when they unequivocally do so, or when they confine matter, that the knife should be employed to divide them.

DRESSINGS, AND CONSTITUTIONAL TREATMENT.

The best general dressings for gun-shot injuries, and the absurdity of several of the former modes of treatment, were accidental discoveries, if we can use that expression, when the genius of a Paré was concerned in making them. "I had heard of nothing (says he) so often as of the poisoned nature of gun-shot wounds, and had read both in De Vigo and in Guy de Chauliac, of burning them with burning oils. When the French armies made their way into Piedmont, many of our soldiers were wounded in the smaller garrisons; and I saw the army surgeons using their terrible cauteries, and I also followed the common practice, and dressed the wounded with boiling oils, until all my oils were expended. On the night when this happened, I dressed my wounded soldiers with oil of roses, and turpentine with whites of eggs. I went to bed much oppressed, with the apprehension, that all these poor fellows would be found in the morning poisoned and dead; I arose, therefore, betimes, and learnt, to my infinite surprise and pleasure, that they had slept well and easy, without any pain, or swelling, or redness about the wounds; while those of my soldiers who had been cauterized with hot oils, had great fever and swelling, and excruciating pain." This fortunate accident made Paré afterwards invariably prefer the milder dressings; a wise resolution, to which he probably owed all his future success.

From the degree of contusion, laceration, and sloughing, produced in the generality of gun-shot wounds, no hope of union by the first intention can be entertained. Supposing the degree of injury is not such as to demand the immediate performance of amputation, and yet the bones are fractured, and the limb otherwise considerably hurt, the surgeon is first called upon to extract whatever splinters of bone and foreign bodies admit of being taken away without too much irritation. Should any violent hemorrhage exist, which is not a frequent event in these cases, the bleeding vessel must be secured without delay. The limb is then to be laid on a splint, that has upon it a thick pad, and an eighteen-tailed bandage. The wound is to be dressed with dry lint, or what is always preferable, a pledget of common cerate. I think adhesive plaster, which is sometimes recommended as a first dressing for

gun-shot wounds, never answers so well as common lint, or pledgets of any simple ointment.

The tails of the bandage are to be methodically laid down over each other, and these, with some folds of linen, which are to be placed along the limb, may be wet with the liquor plumbi acetatis dilutus, or what is equally good, simple cold water. The practice of keeping the wounded limb, or part, thus enveloped in linen wet with cold lotions, or common water, cannot be too highly commended, as an excellent plan for the first day or two, and one that can always be pursued with ease, under any of the circumstances and difficulties which occur in the military service. Even were the wounded simply to have their injuries covered at first with loose wet linen, instead of tight bandages, I believe we should see fewer cases of mortification than actually occur. The wound having been dressed, such other pads and splints as may be requisite, are then to be put on the member, and secured with straps and tapes. Lastly, the limb is to be put in the most eligible posture, and to be kept as quiet as possible.

If the patient be young and strong, and should not have lost much blood, he is to be immediately bled, unless the system appears temporarily depressed by the shock of the accident, in which circumstance the surgeon should rather administer cordials. Besides occasional bleedings, according to circumstances, the application of leeches to the neighbourhood of the wound, is extremely beneficial during the inflammatory stage; and, indeed, so are all the means advised for the relief of inflammation.

In the course of the first 24 hours, the swelling of the part and the inflammatory fever come on. In a fracture, it will generally be best to persist in the employment of cold lotions, because the linen and bandages can be wet with them without taking off the splints, and disturbing the limb, as must be done if poultices be employed. When, however, suppuration begins, the pledgets and first dressings must be removed; and then the surgeon, if he prefer the method, may have recourse to emollient poultices, though they are always inconvenient applications under splints. In all other cases, they are undoubtedly the best local remedies, after the first day or two, during which cold lotions may be used with great advantage. Saline and aperient draughts are to be administered, and, if the pain be severe, opium. Should mortification follow, notwithstanding every effort to counteract it, the surgeon is to take the proper opportunity to amputate, and not wait, as was formerly advised, until an inflammatory reddish circle indi-

cates the commencement of a separation of the living from the dead parts.

If the inflammation terminate in suppuration, the quantity of matter is, in some measure, proportioned to the contusion and other mischief; and, when the case prospers, the inflammatory symptoms abate, the eschars are thrown off, the quantity of matter gradually diminishes, the cavity of the abscess is filled up with healthy granulations, the broken bones unite, and the patient at last recovers.

Unfortunately, in many cases, things do not go on in this desirable way. The pus does not become less copious, and it assumes a sanious, thin, fetid quality. The greatness of the discharge brings on weakness and hectic symptoms, and the patient falls into a dangerous state. Here the nicest judgment is often required in deciding, whether the attempt to save the limb should be continued, or amputation be done without delay.

In the suppurative stage of gun-shot wounds, the same internal medicines and diet, and the same external applications, are indicated, which I have specified in the chapters on supuration and ulcers.

In cases of gun-shot wounds, then, the dressings are to be superficial, and of the mildest description possible; at first some lint and a pledget of white cerate, with cold applications, and afterwards emollient poultices and fomentations. What good can introducing lint into the orifice of a gun-shot wound produce? Is this practice designed to prevent its closure? If it is, the idea is absurd, as gun-shot wounds are little disposed to unite by the adhesive inflammation. Fomenting the part, two or three times a day, with a decoction of white poppies, certainly deserves recommendation; for it always diminishes pain, and, consequently, must have a good effect on the inflammation. The consolidation of a gun-shot wound is the work of nature. The steps, which she takes to effect it, have been noticed in treating of granulations. A suppurating gun-shot wound is only an abscess, in which there are frequently extraneous bodies. To maintain a ready exit for the pus, and to remove all extraneous matter, which may be loose, and sufficiently near the surface of the body, is all the surgeon can usefully do.

When a limb is torn off by a cannon-ball, all the best army-surgeons recommend amputation of the stump, in order to procure an even, smooth incision, instead of an irregular, jagged, and highly dangerous wound. Even Mr. Mann,* hos-

* Medical Sketches of the Campaigns of 1812, 1813, 1814, &c. p. 207. 8vo. Dedham, 1816.

pital surgeon of the American army, and by no means a zealous advocate for immediate amputation in many cases now considered as urgently requiring such a proceeding, accedes to the proposition, that, when a limb is carried away by a ball, or by the bursting of a grenade or a bomb, the most prompt amputation is necessary, and that the least delay endangers life. As the bone is liable to be split extensively upwards, some even deem it invariably necessary to perform amputation, if possible, above the nearest joint. Others object to the practice, on the ground that such wounds are disposed to end favourably without amputation, and that the state of the system does not admit of the operation being done with the best prospect of success.

But when the operation is not done, an irregular wound of this description requires considerable incisions, for the extraction of foreign bodies, for the discharge of matter, and for the purpose of shortening the projecting muscles and tendons; measures, which produce as much, and even more pain and irritation, than amputation, without equal good. If a few cases can be cited, in which patients with shattered stumps survived, with the parts firmly healed,* a much larger number has occurred, in which this reluctance to operate had the most fatal consequences. The surgeon may the more readily make up his mind to amputate, as the loss of a limb is not in question.

With respect to amputating above the nearest joint, this must depend in a great measure on the distance of the injury from the articulation; no one would think of amputating above the knee, when the injury is near the ankle.



CHAPTER XX.

OF POISONED WOUNDS.

As poisoned weapons are not made use of by civilized nations, and venomous animals are not numerous in this country, our opportunities of seeing poisoned wounds are but limit-

* Some years ago, Mr. Weir, the late Director-General of the army medical department, pointed out to me a soldier, in the York hospital, who from the appearance of his stump, had had his arm as well taken off by a cannon-ball as it could have been by the knife.

ed. The bites and stings of insects; accidental pricks and cuts, received in dissection; the bites of adders; and those of rabid animals; are the chief cases. Of these, only the two last will be noticed in this volume.

BITE OF AN ADDER.

The poison of this reptile is lodged in capsules, at the roots of two moveable fangs in its upper jaw, which, when the animal bites, are directed perpendicularly downwards, and the venomous fluid, being then compressed out of the capsules, flows through the grooves of the fangs directly into the bitten part.

The effects of the bite on the human subject usually take place with great rapidity. An acute pain, and a burning sensation, are immediately experienced in the part, which soon begins to swell. The pain, heat, swelling, redness, and tension, quickly extend a considerable distance from the punctures, frequently affecting the whole limb, on which livid spots make their appearance. In some cases, the pain is not confined to the limb, or parts in the vicinity of the injury, but affects the viscera and other remote organs. Dejection of spirits; alarming syncope; a frequent, small, concentrated, irregular pulse; difficulty of breathing; cold profuse sweats; confusion of vision, and of the mental faculties; vertigo; prostration of strength; headach; nausea and a convulsive vomiting of bilious matter; followed almost always by a general yellowness of the skin, and sometimes by pain about the navel; are the symptoms usually denoting the operation of the poison of the viper on the whole constitution. When the case ends fatally, a kind of gangrenous inflammation of the cellular membrane, the sort of disease lately described under the name of diffuse inflammation of the cellular substance, and noticed in the chapter on erysipelas, is generally produced in a greater or less degree. In this country, the bite of an adder seldom proves fatal to man, and, according to Fontana, the danger of the injury is commonly in proportion to the smallness of the animal that receives it. Hence, children suffer more indisposition from the bite, and more frequently die from its consequences, than adult persons, as is proved by certain facts published by M. Pautet.* The same author likewise refutes Fontana's statement, that the bite never kills a grown person, of which event, indeed, some ex-

* Obs. sur la Vipère de Fontainebleau, 1805.

amples have been known in Great Britain. Another fact, which he explains, is, that of the more perilous effect of the poison on animals already weakened by disease, than on those in a healthy state; in illustration of which observation, he records the case of a horse, which being bitten on the cheek, while in an enfeebled condition, died of the accident in eighteen hours. The activity of the poison is described by all writers as greatest in hot weather, and the effects of the bite are remarked to be generally more rapid, the nearer the injury is to the heart, and the quicker the circulation of the blood at the time of its reception.

The treatment consists of local and constitutional means: by the former, we endeavour to prevent the absorption of the venom; by the latter, we strive to avert the ill effects of absorption, if it should take place, and appease the bad symptoms, when they have come on.

The application of a ligature round a limb, above the bite, with the view of impeding the entrance of the virus into the circulation, was a plan, which Fontana, as well as Paré, found particularly useful. The objections to this practice are founded on the inconvenience, and even danger of mortification, likely to result from the long-continued constriction of the limb. It may also be supposed, that after the removal of the ligature, or tourniquet, the virus would still find its way into the circulation; but, if Fontana's statement be correct, this is not generally the case, and the fact may depend either upon the interruption of absorption produced by the inflammation, or upon some change effected in the virus during its lodgment in the part.

One of the most effectual plans for the hinderance of the absorption of the virus, is the excision of the bitten part* I should have more confidence in this treatment, than in attempting to destroy the part with the actual or potential cauterity. Fontana's observation, however, that the bad symptoms, when begun, cease after amputation of the part, is at

* {A revival of the method of treating poisoned wounds by cupping glasses, excising the bitten part, and cauterizing, as recommended by Celsus, and other ancients, has been attempted by some modern writers. Experiments have been repeated, which, in some degree, confirm the opinions entertained by the ancients. The benefit derived from the application of common salt, as recommended by Celsus, we have ourselves witnessed in several cases of stings by the Mexican scorpion, which, especially in children and aged persons, often prove fatal. The part stung was punctured by a lancet, and the wound filled with salt. The relief of the smarting caused by the application, was followed by an immediate subsidence of the pain and swelling of the limb, and in a few hours no marks of the poisoning remained.}

variance with what Russell has stated with regard to the serpents of India. The eau de Luce, (a medicine resembling the spiritus ammoniæ succinatus) and olive oil, are also celebrated local remedies for the bites of snakes. In order to form a correct judgment of their real efficacy, it must be recollected, first, that the bite of an adder rarely proves fatal, and the patient would generally recover with little, or even no assistance at all. Secondly, that the virus of the animal varies in its quantity and force, according to circumstances, and therefore its effects are sometimes but slight. Thirdly, that both the foregoing applications have repeatedly failed in averting the severity of the symptoms, whatever appearance of efficacy they may have had in other examples. In South America, the plant, named *mikania guaco*,* is regarded quite as a specific for the bites of serpents. The plan is to chew it, and then lay it on the wound, the juice being used also as an internal medicine. An investigation into the real power of guaco by a committee of well-informed professional men, is at present a desideratum.

The internal remedies, which have gained repute for their good effects in counteracting the operation of the venom of snakes, are, besides guaco already mentioned, ammonia, eau de Luce, olive oil, and arsenic. Six or eight drops of the liquor ammoniæ may be given in a little peppermint water, or a glass of sherry, every two hours. The dose of eau de Luce is a teaspoonful, which, if necessary, may be repeated every three or four hours. These two medicines, however, are not considered, in modern days, as deserving the name of antidotes for the bites of snakes, though they may be useful in preventing the syncope, prostration of strength, and mental dejection, apt to occur in such cases. The character of arsenic is supported by much better evidence; and according to some experiments detailed by Russell, and several cases recorded by Mr. Ireland, it seems actually to possess very considerable specific power in preventing, and even removing, the ill-consequences of the poison of various serpents. The formula used by Mr. Ireland, was $\mathfrak{z}\text{ij}$. of the liquor arsenicalis, and ten drops of tincture of opium in $\mathfrak{z}\text{iss}$. of peppermint water, to which $\mathfrak{z}\text{ss}$. of lemon juice was added just before the medicine was taken. The same draught was repeated every half hour for four hours in succession. The inflamed parts were often fomented and rubbed with a liniment, composed of half

* Humboldt and Bonpland, *Plantes Equinoxiales*, t. ii. p. 84. tab. 105. ; also Orfila, *Traité des Poisons*, t. ii. p. 533. ed. 2.

an ounce of turpentine, the same quantity of ammonia, and an ounce and a half of olive oil. Cathartic clysters were exhibited as soon as the patients began to be purged, and the arsenic was discontinued.*

BITE OF A MAD DOG.—HYDROPHOBIA.

Of all the poisoned wounds, which happen in this country, the bites of certain rabid animals are the most dangerous, as they are apt to give rise to one of the most dreadful and incurable disorders to which human nature is liable. The rabies of certain animals, here alluded to, is described by writers as either originating spontaneously, or as being communicated to them by the bite of an animal already labouring under it. Whether it ever arises spontaneously in the human subject, is a doubtful point; the cases adduced as proofs of it, being by no means free from ambiguity. Horses, mules, asses, horned cattle, pigs, and, still more frequently, foxes, wolves, cats, and dogs, are attacked by rabies. Although the infection may be received, and propagated by other animals, it probably never originates in any except those of the canine race.† The hydrophobic poison, I believe, can only produce its terrible effects on the human constitution by inoculation, that is to say, the virus, which is blended with the saliva of a rabid animal, must either be introduced into the cutis by a bite, or be applied to a scratch, cut, or excoriation. As these slight injuries are frequently unnoticed, or forgotten by persons who have been handling infected dogs and cats, and the illness of the animals themselves is also not even suspected, we cannot be surprised that the idea of the disease sometimes having a spontaneous origin in man, should thus receive countenance. In consequence of the virus being mixed with the saliva of the rabid animal, when a person is bitten through a boot, or other thick clothing, the chance of infection is lessened, inasmuch as there is a possibility of the poison having been completely wiped from the teeth in their passage through the leather, or other clothing. Hence, also, bites of the naked face, and of the fingers and hands, unprotected by gloves, are reckoned particularly dangerous, and alleged to be in general not only more frequently followed by hydrophobia, than bites of other parts covered by the clothing, but to be also sooner followed by it.

* See Med. Chir. Trans. vol. ii. p. 393.

† See Hillary on the Diseases of Barbadoes, p. 246.

The human race seems much less susceptible of the infection than dogs. Four men and twelve dogs were bit by the same rabid dog; all the dogs died rabid; but the four men escaped, though they used no other means of prevention, than such as we see every day fail. On an average, not more than one person out of sixteen bitten, takes the distemper;* an important fact, to be remembered in judging of the true merit of any preventive methods of treatment.

From an experiment made by Magendie and Breschet, it seems that the saliva of a hydrophobic patient is capable of communicating the disorder to dogs by inoculation.† The same thing has been repeatedly tried in England, without any effect.

The interval between the infection and the commencement of the disease, varies considerably in different instances. Out of 131 cases, only three patients took the disease before the eighteenth day; none before the eleventh; from the eighteenth to the thirtieth, seventeen were seized; sixty-three began to be ill from thirty to fifty-nine days after the bite; twenty-three were attacked from two to three months inclusive; nine from three to four months; two at five months; one at five months and eleven days; one at six months; one at seven months; two at eight months; one between eight and nine months; two at nine months; one at eleven months; one at fourteen months; two at eighteen months; and one at nineteen. To cases happening beyond this last interval, Dr. Hamilton attaches no credit.‡ One case related by Dr. Bardsley, on the other hand, seems not to have commenced till twelve years after the bite.§ The most frequent time, for the beginning of the symptoms, is about six or seven weeks after the accident.

A dull heavy pain first takes place about the wounded part, the cicatrix of which sometimes becomes red, or even festers, and discharges a thin red ichor. When the bite has been in the hand, the pain shoots up to the shoulder and neck, and not particularly to the axilla. A gloom is diffused over the spirits, accompanied with listlessness and anxiety. The patient becomes timid and distrustful, sleeps unsoundly, and often courts solitude. In a few cases, the distemper begins with a paroxysm of shivering. The night is passed in rest-

* See Hamilton on Hydrophobia, vol. i. p. 31.

† Orfila, *Traité des Poisons*, t. ii. p. 529. ed. 2.

‡ Hamilton, vol. i. p. 113.

§ Mem. of the Literary and Philos. Society of Manchester, vol. iv. part 2. p. 431.

lessness ; the appetite begins to fail, and some thirst is experienced : now the peculiar symptom, which gives the disease its name, the dread of liquids, is discovered, often accidentally, on the patient attempting to take drink.

There are a few cases which cannot, with accuracy, be said to have any melancholy stage ; the pain about the wounded part, and the difficulty of swallowing liquids, being preceded by no loss of spirits, nor any kind of mental despondency.

The patient is not only unable to swallow liquids, he cannot behold them without terror, nor hear them mentioned without disgust. This fear, however, is not the result of a mental aversion to fluids ; but is the consequence of the insufferable sensations which the attempt to swallow them, or even the sound or sight of them, produces. When the patient attempts to drink, he immediately sobs in a convulsive manner, experiences a dreadful choaking pain, and is seized with general convulsions. Patients have tried to drink with the firmest resolution ; but on the liquid approaching their lips, the intolerable disorder excited, baffled the endeavour.* If, with great suffering, a little drink is swallowed, it is sometimes immediately vomited up again, tinged with bile.† This symptom, hydrophobia, then, is not a delirious dread, or hallucination of the mind ; but a matter of experience, which at first surprises the patient himself.‡

Even shining surfaces, which reflect the light, as water does, are sometimes to hydrophobic persons intolerable. This was not the case, however, with the poor woman, who died in the summer of 1808, in St. Bartholomew's hospital ; for, she made use of a looking glass, without any inconvenience.

But the dread of swallowing liquids, although the most singular symptom, constitutes but a small part of this distressing malady. The mind and body are affected with extreme irritability, and excessive susceptibility to all impressions. Hence, the constant watching and inquietude ; the impatience and sudden fits of anger from trivial causes ; the distress and the violent paroxysms brought on by such circumstances as the slightest motion of the air, the shutting of a door, the buzzing of a fly, &c. Hence, also, the patient's timidity and incessant apprehensions, and the occasional fits of delirium and incoherence, from which he quickly recovers.

In this disease, the fauces are always oppressed with a large

* Marcet, in *Medico-Chirurgical Trans.* vol. i. p. 138.

† *Mem. of Manchester Society*, vol. iv. p. 439.

‡ See Mead on Poisons, p. 146. edit. 3.

quantity of a thick, tenacious mucus, and, as the patient cannot swallow even his own saliva, he is continually spitting it out.

The degree of mental derangement differs greatly in different examples; in some it hardly exceeds great irritability and impatience; in others, it amounts to muttering and incoherent talking, with rational answers to questions; and, in a few, it rises into short fits of the most ungovernable rage and fury, the patients biting and tearing themselves, and every thing near them.

At length, the muscles of deglutition are more continually affected with excruciating pain, which gradually extends itself to the diaphragm, and abdominal muscles. The convulsions become more violent, and the fits of suffering more frequent, the patient's countenance is full of horror, and his eyes look red and furious. Sometimes, the patient, notwithstanding such symptoms, retains his senses to the last.

The duration of life, after the commencement of the symptoms, varies from thirty-six hours to five days, very rarely to six.

The difference between rabies canina and tetanus, is not invariably such as to prevent the latter from being mistaken for the former. Tetanus is mostly occasioned by slight wounds of the fingers, toes, or other tendinous parts. It does not commonly begin till some time has elapsed after the injury, and, perhaps, the wound is healed. It is marked by violent paroxysms of general spasm, which begin about the throat and neck, and are accompanied by a difficulty, or inability of swallowing. These spasms are excited by the most trivial causes; for, merely attempting a change of posture, endeavouring to swallow, or even to speak, will sometimes produce a renewal of spasms over the whole body.* Tetanus and rabies canina also mostly end fatally about the fourth day. Some cases must be exceedingly difficult to discriminate. Dr. Bardsley describes an instance, where a slight injury of the finger, with a splinter of wood, was followed, in about a week, by spasms of the lips, locked jaw, and paroxysms of general spasm. On the third day after the attack, the young gentleman could not swallow any watery fluids, nor bear them to be brought near him, without fresh and more violent attacks of spasm being thereby induced. Another similar case arose from the bite of a horse. In both these examples, a recovery took place.†

* Cullen's First Lines of Physic, vol. iii. Chap. on Tetanus.

† Mem. of the Manchester Society, vol. iv. p. 477.

In tetanus, the spasms generally come on sooner after the local injury, than those of rabies canina; the jaw is rigidly locked, and the muscles of the neck and back are particularly affected; the muscles are more unremittently contracted than in hydrophobia, their action only abating for a time in degree; there is less fever, less quickness of pulse, and less thirst; and the extreme anxiety and irritability of mind, which accompany rabies canina, do not prevail.*

The name, hydrophobia, has certainly led to much confusion, because it creates an idea, that the most essential and distinguishing symptom of rabies canina, is a dread, or difficulty, of swallowing fluids. The symptom hydrophobia is far from being peculiar to canine madness: it has occurred in typhus fever, tetanus, hysterics, variolous sore throat, inflammation of the stomach, pleurisy, peripneumony, St. Vitus's dance, &c.† Neither is the dread of liquids an inseparable symptom of rabies canina.‡

As no medicine, hitherto discovered, is capable of infallibly counteracting the baneful effects of the canine poison, practitioners are strongly called upon to impress on the minds of the patient and his relations, the necessity of doing whatever is most likely to prevent the constitution from being affected.

As a preventive, surely nothing is more rational, nothing is so forcibly indicated, as the excision of the part bitten immediately after the accident. In all poisoned wounds, the adoption of other steps to prevent the system from being affected, is inferior to the obvious efficacy of this measure, which, the sooner it is practised, the greater must be the chance of success from it. When the operation has been neglected at first, it ought yet to be done; for there is reason to believe, that it may answer, not only several days, but several weeks after the bite, and, indeed, at any time before the symptoms have actually begun.

Were a person to receive a bite close to a largish artery, like the radial, one fatal instance of which fell under my own notice, I am of opinion, that, if the animal from which the injury was received, were undoubtedly rabid, the part ought still to be cut out, even though the operation might not be practicable without removing a portion of the vessel itself.

* Rees's Cyclopædia, art. Hydrophobia.

† See Mead on Poisons, p. 147. Sauvage's Nosol. Method. Edinb. Med. Essays, vol. i. pp. 222 and 227. Ferriar's Med. Hist. and Refl. vol. iii. pp. 24—26. Rees's Cyclop. loco citato.

‡ Hildanus, Obs. 88, and Mead on Poisons, loco citato.

When the bite extends very deeply, so as to render the complete excision of it impossible, some writers recommend amputation; but it is a practice rarely adopted, on account of the severity and mutilation attending it.

If excision be not practised, the other less certain measures for the prevention of infection, are the application of the actual or potential cauter, particularly caustic potassa, quicklime, muriate of antimony, nitrous acid, or the moxa. Bathing the wound with chlorine, or hydro-chloric acid, and keeping it covered with linen wet with this medicine, which is also given internally, is another practice, in favour of which, some cases published by Brugnatelli, deserve attention. The dilatation of the wound, and the application of cupping glasses to it, as well as the plan of keeping up a discharge from it for a considerable time, may likewise be mentioned.

Various specifics for the prevention of rabies canina have been extolled, though generally without sufficient proof of their real efficacy. No modern practitioner has the least confidence in the pulvis antilyssus of Dr. Mead; the famous Tonquin medicine; or the Ormskirk remedy. Neither does cold bathing, or rather half drowning the patient in the sea, retain as many advocates as it did in former times. With regard to the most powerful articles of the materia medica, I may say, that they have all been repeatedly tried, and as repeatedly found ineffectual; musk, ammonia, opium, belladonna, stramonium, hyosciamus, arsenic, æther, the nitrate of silver, and mercury in every possible form.

That cases may be found in the annals of medicine, intended to prove the efficacy of these and other remedies, as preventives, must not be dissembled; but, they are all of a questionable and inconclusive description; because, in general, before any preventive remedy is tried, the wound is well washed, or some other means taken to free it from the virus. In this circumstance, the latter measures may be the cause of any benefit really obtained. Hydrophobia also only happens in a small proportion of patients, who are bitten by animals truly rabid; and, be it recollected, that these are frequently not rabid when vulgar report describes them as being so.

After the system is affected, the methods of treatment yet entitled to further trial, seem to me to be, first, the practice of venesection until the pulse can scarcely be felt, as successfully adopted by Schoolbred and Tymon in the East Indies. At the same time, I ought to mention, that, in Europe, such treatment has not hitherto answered the expectations once raised by the reports of its efficacy in Asia. Secondly, the external and internal use of chlorine, or the hydro-chloric

acid. Thirdly, the injection of morphine, extract of opium, stramonium, laurel-water, belladonna, or simply lukewarm water, into the venous system, as suggested and tried by Magendie, Dupuytren, Breschet, Brandreth, and others; though as yet, only with a partial and temporary relief of the symptoms of some of the cases. Whether this plan of trying the effects of powerful remedies, introduced directly into the veins, instead of into the stomach, will lead to the discovery of an antidote for hydrophobia, further experience can alone decide. The bite of a viper has been sometimes tried. Although I strongly recommend perseverance, and would not on any account discourage the boldest experiments in so desperate a case, truth obliges me to say, that, as far as our present knowledge of their results extends, there is nothing yet established, that can justify us in lessening our opinion of the high importance of preventing the disease by the early excision of the bitten parts. In Russia, the cauterization of vesicles, discernible under the tongue in an early stage of the case, and the exhibition of a drachm of the powder of genista, three times a day, are said to have prevented and even cured the disease.



CHAPTER XXI.

CONTUSIONS

ARE produced by the impulse of a blunt, hard surface, against the body, the skin remaining unlacerated. The consequences are, a diminution of the tone of the injured fibres, and a rupture of an infinite number of small vessels. The bruised muscles are weakened, and cannot be exerted without pain; and the extravasation of blood causes swelling, and a black and blue discoloration of the skin, termed *ecchymosis*. Sometimes vessels of considerable size are ruptured, and a copious effusion of blood under the integuments is the result. In contusions of the head, we often see the scalp enormously elevated by hemorrhage beneath it, and large collections of blood are frequently found extravasated in the cellular substance of almost every situation in the body.

Violent contusions not only affect parts, on which the force immediately falls, their effects reach those which are remote

from the place directly struck. The second sort of contusion is what the French term a *contre-coup*, in which the injury is to be imputed to the effect of a very powerful concussion.

The ill-consequences of a bruise are not always proportioned to the force applied; but sometimes depend on the nature of the injured part. If the bruise take place on a bone, thinly covered with soft parts, the latter always suffer very severely in consequence of being wounded, at the time of the accident, between two hard bodies. Hence, bruises of the shin so frequently cause sloughing and troublesome sores.

Slight contusions may be considered as occasioning only a weakness, and a degree of extravasation in the part, which may be rubbed once or twice a day, with the linim. saponis comp., or be covered with linen moistened with vinegar, cold water, brandy, lime-water, solutions of alum, or of acetate of lead. The bowels should also be opened with a dose or two of salts. When muscles are bruised, they ought to be relaxed and kept perfectly quiet, nothing being more conducive than quietude to the restoration of their proper tone.

When the contusion is of a more violent description, and the quantity of extravasation is considerable, bleeding, and other evacuations, together with the use of leeches, are proper. The topical applications should be mildly stimulating, and, consequently, such as are calculated to promote the action of the absorbents. Muriate of ammonia, dissolved in equal parts of vinegar and water, or the liq. ammon. acet. forms an excellent lotion. When the inflammation has subsided a little, liniments containing camphor may be used.

In cases, in which there is no danger of serious inflammation, and the chief indication is to promote the absorption of extravasated fluid, bandages act very beneficially, by the remarkable power which they have, of exciting the action of the lymphatics. It is best, however, not to employ them too early.

It is surprising, what large collections of blood will sometimes take place about the shoulder, and under the scalp, in consequence of bruises. Many surgeons would be induced to puncture such swellings, and let out the extravasated fluid. Without condemning every instance of this practice, I have no hesitation in pronouncing it to be in general hurtful. In ordinary cases, under the use of discutient lotions, and aperient medicines, the blood is rapidly absorbed. But, when an opening is made, the admission of the air to such blood as cannot be pressed out, makes it putrefy; febrile symptoms arise; the part is often attacked with an erysipelatous red-

ness; and extensive abscesses, sloughing, and death, have been the too frequent consequences.*

Should the distention, however, threaten to bring on sloughing, every one must coincide in the propriety of discharging the blood by an incision. I have seen many cases, in which the whole scalp was prodigiously raised and distended by blood, effused in consequence of a blow; but, generally, in about a week, the swelling entirely disappeared, with the aid of bleeding, purging, and the lotion of vinegar and muriate of ammonia.

From the observations and cases, published by Pelletan, it appears, indeed, that a puncture may sometimes be advantageously made in collections of extravasated blood; but, only after discutient means have had a fair trial, and the tumor has existed a considerable time.†

The putrid decomposition of extravasated blood, great local irritation, an erysipelatous affection and sloughing of the part, severe febrile symptoms, and death, sometimes take place, in consequence of the inflammation arising from the violence of the contusion; for, when the parts unavoidably slough, or suppurate, from the degree of injury inflicted, the sloughs and matter become blended with the effused blood, and, in this circumstance, the latter fluid inevitably putrefies.‡ Here an external opening should be promptly made, and even this will not avail, unless the contents be completely discharged. It matters not, whether the external opening, in a collection of extravasated blood, be made by accident or design: putrefaction of such portion of this fluid, as cannot be discharged, and the severe effects already hinted at, are the consequence.

Besides cases, in proof of the foregoing statements, Pelletan has related others, tending to show, that, when the whole of the extravasated blood can be completely discharged, and the sides of the cavity can be so effectually compressed together as to exclude the air, the making of an incision may sometimes prevent bad symptoms, instead of inducing§ them. It is acknowledged, however, that, if an opening is made, and the blood cannot be entirely evacuated, nor the cavity obliterated by compression, such practice leads to a putrefaction of

* Several cases, illustrative of the evils arising from an external opening, are detailed by Pelletan, in his *Clinique Chirurgicale*, tom. ii. *Mem. sur les Epanchemens de Sang*, p. 161, &c.

† See *Clinique Chirurgicale*, tom. ii. pp. 130, 131. Cases 10 and 11.

‡ Vide Pelletan in the Memoir above referred to, p. 139, &c.

§ Vide Pelletan in the Memoir above referred to, pp. 192—211.

the part of the blood left behind, and does much harm. I must leave it to the experienced surgeon to decide, whether it is generally in our power to discharge, thus completely, every particle of extravasated blood, especially in recent cases, where that fluid is not contained in one cavity, but is widely diffused in the interstices of the cellular membrane.

In cases, where extravasated blood putrefies, and the whole cannot be discharged, Pelletan* suggests, whether it may not be proper to counteract the process, by introducing into the cavity alcoholized or acid injections, &c. I can conceive, indeed, that, by chemical means, we might stop the putrefactive process in the effused blood; but, the irritation of these injections, on the living and highly inflamed parts around, no doubt, would do more mischief than the putrid blood itself.

Amongst the examples of contusion, in which the utility of making an incision for the discharge of extravasated blood appears to be decidedly acknowledged, I may mention those, which are improperly called wind-contusions, the nature of which is pointed out in the chapter on gun-shot wounds.



CHAPTER XXII.

ULCERS.

By some surgical writers, an ulcer is defined to be a solution of continuity in the solid parts of the body, accompanied with the discharge of a purulent fluid. According to this definition, the term *ulcer* is synonymous with the words *sore*, *suppurating wound*, and *open abscess*. By others, the word is restricted entirely to those solutions of continuity, from which an ichorous, sanious, or vitiated matter is discharged, attended with a loss of substance in the part. Although Professor Thomson thinks more favourably of this definition than of the former, I cannot help expressing a decided preference to the first, for the very reasons which this judicious surgeon has himself suggested.† If we object to calling suppurating wounds, and such abscesses as have burst, ulcers, as long as they discharge healthy pus, what particular

* Vide Pelletan in the Memoir above referred to, p. 237.

† Lectures on Inflammation, p. 426.

reason is there for approving of their receiving this name only when the matter from them happens to be of a bad quality? The healthy or unhealthy state of the discharge from a sore or abscess is an accidental circumstance, depending upon the favourable or unfavourable condition of the parts to admit of the process, by which they are to be healed. If the preceding capricious method of defining an ulcer were to be sanctioned, every ulcer would cease to be so called as soon as the discharge from it presented the appearances of healthy pus; nor could there ever be any such ulcer as that, which has usually been described under the name of the simple healthy ulcer. It seems to me, that, in a general sense, we may consider sores or ulcers of every description, as chasms or breaches more or less gradually formed in the substance of the body, by a process, well known by the name of *ulceration*, in which the absorbents of the part remove the old particles back into the system more quickly, than the new ones are laid down by the secerning arteries. Ulceration does not invariably spread by that kind of destruction of the parts, where no remnants of the destroyed portions are left. Sometimes portions of organs, about to be destroyed, are observed to slough, and mortification is then partly concerned in extending the destructive process. Such cases are less frequent, however, than other instances, in which we know that a considerable extent of parts has been destroyed, without any remains of them being perceptible. Surgeons have endeavoured to discover the physiological reason of this curious fact; and an explanation is offered, which supposes that nutrition ceases in the ulcerating parts, while the destructive function of the lymphatic system, absorption, still proceeds.* Sometimes, however, the destruction of parts, the actual loss of substance, is only apparent; as, when a sore is the consequence of a simple incised wound, that has not united by the first intention, and continued for a greater or lesser time unhealed. Here we have sometimes the appearance of a cavity, from the retraction of the parts; but none of the flesh has been in reality removed, either by the accident itself, or by any subsequent action of the absorbent vessels. An ulcer, resulting from such a cause, is different, therefore, in respect to the process by which it is formed, from another sore, in which a chasm is truly produced in the part by ulceration. Also, when an ulcer is the consequence of mortification, and the separation of the sloughs, the process by which the loss

* Delpch, Précis des Maladies réputées Chirurgicales, t. iii. p. 594.

of substance is occasioned, is very different from what happens in other cases, in which any chasm that may exist, has been wrought by the activity of the lymphatic vessels. However, even in the instance of sores resulting from mortification, the latter vessels are somewhat concerned, inasmuch as it is by them that the uniting medium between the sloughs and living flesh is removed, and the dead parts loosened, so as to admit of separation. With regard to open abscesses, which have become what are customarily named sores, I think there can be no doubt of their being strictly entitled to this name, because here it is the process of ulceration, which always thins the superincumbent skin, and produces in fact the opening by which the matter is discharged. When the abscess has been opened with a knife, however, before the ulcerative process has commenced for the establishment of a spontaneous aperture, the case is then not essentially different from any other sore arising from an incised wound, in which some particular causes impede direct union, and create a necessity for the more circuitous manner of healing, by means of the granulating process. The truth is, in all the foregoing cases, whether sores, suppurating wounds, open abscesses, or large raw cavities left by the separation of sloughs, the parts can be healed only by one and the same process,—the formation of granulations; and the principal differences between them are derived from the consideration, that, in suppurating wounds and abscesses, there is not always essentially a loss of substance, which must, of course, attend every other sore, which is the consequence either of ulceration or sloughing. If the preceding view of things be allowed, and suppurating wounds, especially those of a certain standing, be considered as ulcers, then, of course, I see reasons for not agreeing with Dr. Thomson, that the words “attended with loss of substance” will increase the correctness of the definition, any more than Callisen’s expression does, “*solutio continui in partibus organicis lente exorta*,” &c.* The accuracy or inaccuracy, however, will depend upon the rejection, or not, of the suppurating surfaces of old wounds from the cases regarded as ulcers. Were the term *ulcer* entirely restricted to the effects of the process of ulceration, then, of course, loss of substance, and the gradual manner in which the solution of continuity has been produced, would be essentials in the definition.

The usual causes of ulcers may be said to be abscesses,

* *Systema Chirurgiæ Modernæ*, vol. i. p. 379.

which have burst, or been opened ; wounds which have not healed by adhesion, but continued a certain length of time suppurating, and indisposed to heal with facility and readiness ; various surgical operations in which the knife has been employed ; the separation of mortified parts ; different kinds and forms of external irritation ; and internal constitutional diseases, many of which are of a specific nature, as scrofula, lues venerea, the scurvy, &c.

The division of ulcers into *constitutional* and *local*, true and natural as it is, is to be received with an understanding, that many sores, which at first depend entirely upon internal causes, and are in the beginning of a specific nature, are often changed so much in their nature before cicatrization is completed, that, in their latter stage, they are strictly only local ulcers ; while many other sores, which are at their commencement only of a local nature, quite unconnected with internal causes, afterwards change with any change or affection of the general system, and become, in every sense of the expression, constitutional ulcers.

The prognosis generally depends, first, upon the nature of the cause, and the facility or difficulty of its removal ; secondly, upon the kind of parts attacked, whether of great importance or not in the animal economy ; and thirdly, upon the patient's age, constitution, and mode of life.

The steps which nature takes in the healing of sores, I have endeavoured to describe in the chapters on wounds. With respect to the art of surgery, it is its province to remove and diminish the causes from which an ulcer has originated ; to prescribe a proper regimen, quietude, advantageous posture, and the best dressings. It is only in *compound* and *constitutional ulcers*, than any necessity commonly arises for internal medicines. This term of *compound* is applied to sores, in which the cure is retarded by any complication not existing in what is understood by a *simple* or *healthy ulcer* ; and such complication may be either internal or external. Of the former, we have a specimen in a scorbutic ulcer ; of the latter, in a sore which is prevented from healing by hurtful and improper applications.

Ulcers present themselves in very various forms, but I think it sufficient, in this elementary book, to consider five kinds : viz. the *healthy*, the *irritable*, the *indolent*, the *varicose*, and the *specific*.

1. SIMPLE, OR HEALTHY, ULCERS

Secrete white thick pus, which does not adhere to the sur-

face, and their granulations are small, and florid, with rather pointed tops. As soon as the granulations have risen to the level of the surrounding skin, those next the old skin become smooth, and covered with a thin semi-transparent film, which afterwards becomes opaque, and forms cuticle.

An ulcer, answering this description, is in a healing state, and the surgeon can only be useful by keeping the surrounding skin clean, applying soft scraped lint to absorb the redundant quantity of matter, and covering this simple dressing with a pledget of any unirritating ointment, with a view of preventing evaporation from the surface of the sore, a thing which would lead to the formation of a scab, and often change the favourable condition of the ulcer.

A roller will frequently promote the cure, as it not only serves to retain the dressings, and as a kind of defence to the sore, but also to support the muscles and skin, which are frequently loose and flabby, from the want of the natural exercise of the limb.

I shall presently have occasion to speak of Mr. Baynton's plan of dressing old ulcers of the leg, with long circular strips of adhesive plaster. This method is now not confined to old ulcers, but often adopted with the greatest advantage in cases of simple healthy ulcers upon the lower extremities.

2. IRRITABLE ULCERS.

Irritable ulcers cannot always be known by their appearance, though, in many instances, they can be so discriminated. A sore will invariably partake very much of the nature of the constitution, and when this is known to be irritable, the local complaint will often be so. A surgeon, however, is frequently quite unaware of this quality of an ulcer under his care, until, perhaps, at the end of a little time, not finding the sore heal sufficiently quick, he ventures to apply some stimulating application, or to roll the bandage round the limb more tightly, than at the previous visits. The next day, he is mortified to find, that his patient has passed a miserable night, and that several discoloured sloughy parts have formed on the surface, and also at the circumference of the sore. At other parts, the granulations have been rapidly absorbed, and whatever matter lies on the surface of the ulcer, is diminished in quantity, and of a blackish, fetid quality. When the excellent plan of treating many ulcers, recommended by Mr. Baynton, was first introduced, I saw much mischief result from its being indiscriminately applied by dressers to this kind of ulcer.

Some appearances at once denote the irritable nature of an ulcer. When the margin of the surrounding skin is jagged, and terminates in a sharp undermined edge; when the bottom of the ulcer is made up of concavities of different sizes; when there is no distinct appearance of granulations, but only of a whitish spongy substance, covered with a thin ichorous discharge; when touching the surface causes pain, and frequently hemorrhage, the sore may be set down as of an irritable description.

Irritable sores are particularly often situated over the lower end of the fibula, the anterior surface of the tibia, and ligament of the patella.

The applications to irritable ulcers should be of the sedative kind. The steam of warm water acts very beneficially on them. A warm decoction of poppy heads, applied every morning and evening as a fomentation, by means of flannels, is highly useful. The extract of hemlock, or opium, dissolved in hot water, makes a good fomenting liquor.

Emollient poultices may be employed as the continued application, and that made of linseed is the best. It is frequently found serviceable to lay immediately over the surface of the sore, under the poultice, lint dipped in a solution of opium, (℥iss. to ℥ij. of water). When the weight of the poultice seems to have a bad effect, the lint wet with the above lotion may be covered with a pledget of simple ointment.

The carrot poultice, particularly when made by boiling the vegetable, and beating it into a pulp, deserves to be noticed as a remedy, which agrees with many irritable sores.

Powdered carbon and cream have also obtained repute for their good effects.

It is of great use in these cases, to have a choice of remedies; for those which agree at first, generally lose their virtue after being used a certain time, and it becomes necessary to have recourse to others. Thus six or seven different applications may all have a period at which they are productive of benefit. The pressure of bandages is always pernicious.*

* {In those cases where the inflammation extending around the ulcerated surface has subsided, under the use of poultices or fomentations, and the ulcer itself retains a degree of morbid irritation, great benefit is often derived from washes of weak solutions of the metallic salts, as sulph. zinc, copper, or lunar caustic, especially the latter; the application to be gradually strengthened, as the irritability diminishes. Care should be taken to elevate the limb, and keep it at perfect rest. In depraved constitutions, ulcerated surfaces are apt not only to become irritable, but to assume various states of morbid actions, attended with different kinds of discharges, as ichorous, sanious, &c., or are covered with serdes, or attended with sloughing. The sloughing may

3. INDOLENT ULCERS.

The appearances of indolent ulcers are the very reverse of those characterizing irritable sores. The edges of the surrounding skin are thick, prominent, smooth and rounded. The granulations are smooth and glossy, the pus is imperfectly formed, and blended with flakes of coagulating lymph, which adheres so firmly to the surface of the ulcer, that it can hardly be wiped away. The bottom of the sore forms almost a level, and its general aspect gives the idea of a portion of the skin, and parts underneath, having been for some time removed, and the exposed surface not having commenced any new action to fill up the cavity.*

This is the most genuine indolent ulcer. In other cases, the appearances bear some resemblance to those of that opposite kind of sore, the irritable ulcer.

Indolent ulcers form the majority of those which are to be seen in the large hospitals of this metropolis. Their granulations are endued with a weak living principle, and are very apt to be suddenly absorbed without any assignable cause.

When poultices are improperly applied a long time to indolent ulcers, the chasms will be filled up with large, loose, pale, glossy granulations, which would never acquire the power of forming a durable cicatrix, if the same relaxing treatment were to be continued. These weak unhealthy granulations, when stimulated by topical applications, undergo a considerable change, becoming smaller, more compact, redder, and free from their glossy appearance, and the cicatrix, which follows, is more apt to continue healed, than when the sores have been healed by relaxing applications.

Solutions of lunar caustic, touching the surface of the ulcer with the caustic itself, diluted nitrous acid, the unguent. hydrarg. nitrat., and the unguent. hydrarg. nitrico-oxydi, and supporting the sore and the neighbouring skin and muscles

depend upon the application of a specific irritation, or the acrid nature of the discharge itself may keep up the irritability of the ulcer. In such cases, stimulant applications are useful, by exciting a new and more healthy action, as well as by destroying the acrid nature of the discharges. For these purposes, the terebinthinate and balsamic applications are made; diluted acids, solutions of nitre, the chlorurets of soda and lime, pyroligneous acids, &c., not only serve to correct the fetor, but also seem to exert a beneficial effect upon the sore itself.}

* Home's Practical Obs. on the Treatment of Ulcers on the Legs, &c. Edit. 2. 8vo. 1801.

with a roller, were the usual means employed for healing common indolent sores. Bandages have also been found particularly serviceable to such ulcers. The laced stocking was formerly much used, and strongly recommended by Wiseman. As Dr. Thomson remarks,* however, it is in appearance only that this mode of bandaging in ulcerated or varicose legs, has any advantage over that with a common circular roller. The use of the circular bandage, with dressings composed of the unguentum resinæ, and the red oxyd of mercury, in different proportions, was some years ago recommended in a particular manner to the attention of the English public by Dr. Underwood.† He allowed his patients to go about their ordinary occupations under this mode of treatment; first, because it was inconvenient for many of them to be confined; and, secondly, because it was found, that the cicatrices of many patients, whose ulcers had healed up during rest, broke out again as soon as the limb was exercised. The treatment of ulcers with bandages, or fine flannel rollers, somewhat less than four inches wide, also found a very zealous advocate in Mr. Whately.‡ In his cases, very little variety of dressing was employed, and, with a few exceptions, pressure was principally relied upon as the means of cure.

But of all the improvements, which have of late years been introduced into the treatment of old indolent ulcers of the legs, that which was first proposed and practised by Mr. Baynton of Bristol, is by far the most important.

It consists in applying strips of adhesive plaster round the limb, so as to cover the sore. The strips of plaster are to be two or three inches broad, and long enough to surround the limb, and leave an end about four inches long.

The middle of the strip so prepared, is to be applied to the sound part of the limb, opposite the inferior part of the ulcer, so that the lower edge of the plaster may be placed about an inch below the edge of the sore, and the ends are then to be drawn over the ulcer with as much gradual extension as the patient can well bear. As many strips are to be applied in this manner as will cover the whole surface of the sore, and one inch of the limb below and above it. Soft compresses are

* Lectures on Inflammation, p. 447.

† Treatise upon Ulcers of the Legs, &c. 3d edit. 1799.

‡ Practical Obs. on the Cure of Wounds and Ulcers of the Legs, without Rest. 8vo. Lond. 1799.

to be laid over the part, and the limb is to be rolled from the toes to the knee, with calico bandages.

The affected parts are then to be kept moist with cold spring water, which enables the surgeon to remove the strips of plaster without hurting the patient, and, at the same time, keeps off inflammation.*

The advantages of this method are now fully confirmed by repeated trials; the prominent edges of the sore become leveled; the opposite sides are approximated, so that the cicatrix is rendered smaller than it would otherwise be; the patient can be cured while walking about; and the new-formed cicatrix is stronger, and more likely to continue sound, than after the old method of treatment.

4. VARICOSE ULCERS.

Varicose ulcers, or such as are connected with a varicose affection of the neighbouring veins, mostly occur either on the inside of the leg, near the ankles, or on the instep. Their size and number vary in different cases; their edges are indurated, high, and callous; the sores are painful when touched, and exhibit a brownish red colour, which spreads a good way beyond the circumference. The limb is habitually affected with a kind of swelling, that is always rendered worse by much exercise and long continuance in the erect posture, and better by rest and the horizontal position. In the vicinity of the ulcer, small varicose tumors are observable, which are sometimes insulated, sometimes connected together in clusters.† The varicose ulcer, described by Sir Everard Home, has the look of a mild, indolent sore, attended with a varicose state of the trunk and branches of the vena saphena. The sore is seldom deep, and is usually of an oval shape. The case is attended with a deep-seated pain, extending up the limb in the course of the veins. The difficulty of healing varicose ulcers, and their tendency to break out again, are generally acknowledged.

A reference to the history of surgery presents us with four methods of treatment. 1. Topical applications. 2. The destruction of the varices. 3. Compression. 4. The operation of tying the trunk of the vena saphena at the back of the knee.

1. With respect to topical applications, I need only state, that

* See a "Descriptive Account of a New Method of Treating Old Ulcers of the Legs," by T. Baynton. Edit. 2. 1799.

† See *Œuvres Chirurg. de Desault par Bichat*, tom. ii. p. 517.

all kinds have been frequently tried, and as frequently found ineffectual.

2. Former surgeons having experienced the difficulty of healing these sores, began to pay more attention to the varices in the vicinity. These were now considered as keeping up the disease, and, it was inferred, that if they could be destroyed, a cure would speedily follow. Their removal was chiefly attempted in three ways. 1. By excision; a plan which, instead of doing good, sometimes occasioned another incurable sore. 2. By tying the vein above and below the dilatation, and then discharging the contained blood by a puncture. 3. By caustic, and the cautery. I need not detain the reader with an exposition of the well-founded objections to all these means.

3. Compression is one of the best modes of curing varicose ulcers. The advantages of the laced stocking for varices were known to Fabricius ab Aquapendente, Wiseman, and Scultetus; and so were those of dog-skin, which, on account of its elasticity and suppleness, is a very fit material for a compressive bandage. The common roller, however, is the thing generally employed, the limb being compressed with it equally from the foot to the knee. With a bandage thus applied, over a simple dressing, the generality of varicose ulcers may be completely cured.*

4. In cases which resisted compression, Sir Everard Home practised an operation, which consists in tying the trunk of the vena saphena, as it passes over the knee-joint. The patient is to stand on a stool of a convenient height; the integuments are to be pinched up into a transverse fold, and divided; and a ligature is to be conveyed under the vein with a bluntish silver needle. The vessel becomes impervious where the ligature is applied, and the obstruction serves instead of a valve, to take off the weight of the column of blood.† Having seen this operation followed, in several instances, by severe symptoms,‡ I soon began to apprehend that it would fall into disrepute. Others have even known it prove fatal,§ and the practice is now abandoned by the best surgeons of this metropolis. Instead of this operation, another was proposed by Mr. Bro-

* Œuvres Chir. de Desault par Bichat, tom. ii. p. 518.

† See Home on Ulcers, Varicose Veins, &c.

‡ See also a case in Hodgson's Treatise on the Diseases of Arteries and Veins, p. 551.

§ See London Medical Review, vol. ii. p. 356. Oldknow, in Edinb. Med. and Surg. Journ. vol. v.; and Surgical Essays, by A. Cooper and B. Travers, p. 216, &c. 8vo. London. 1818.

die, which has been often practised without any of the severe consequences common after the preceding method. It was suggested by the consideration, that the veins divided in amputation seldom inflame upon their inner surface, while the extension of inflammation far along the vessel towards the heart, in the instances where the vena saphena had been tied, seemed to be the cause of all the severe and fatal symptoms. Hence, Mr. Brodie conceived, that it would be safer to cut the vein completely through, leaving, however, the superincumbent portion of skin undivided, a thing easily accomplished with a narrow, sharp-pointed, slightly curved bistoury, the edge of which is on its convexity. The point of the knife is passed between the skin and vein, until it reaches beyond the vessel. In doing this, the blade is kept with one of its flat surfaces turned towards the integuments, the other towards the vein. Its edge is then to be directed backward, and, by withdrawing the instrument, the requisite division of the vessel is effected.*† I am not acquainted with any examples in which Mr. Brodie's plan of operating has been followed by very bad symptoms, but two cases are detailed in a late work,‡ in which the vena saphena major was exposed, *by dividing the skin*, and then cut across; the hemorrhage was easily stopped with a compress, but severe constitutional derangement followed, and both the patients died. To these reflections we must add another one, in relation to the use of the knife, and of ligatures for the cure of varicose ulcers, viz. that the obliteration of a part of the tube of the vena saphena major, by these means, does not always ensure the patient from a return of the diseased vessels to their former state, with all the pain and inconveniences experienced previously to the operation. This arises from other veins, which run parallel to the saphena, becoming enlarged after the ligature of it, and thus rendering the operation unavailing. Perhaps, simple pressure, and a horizontal position, are yet the safest and best means of curing and relieving varicose veins and ulcers.

* Brodie, in *Medico-Chir. Trans.* vol. vii. p. 195, &c.

† { In the paper of Mr. Brodie referred to by Mr. Cooper, he makes mention of the two operations recommended by Celsus for varicose veins, viz. cauterizing the vein, or cutting a portion of it out. Celsus, under the head of "varices of the legs," gives particular directions for performing both operations. The latter operation has been revived by a distinguished surgeon of this city, and practised by the different surgeons of our country, though we believe with variable success. }

‡ Hodgson on Diseases of Arteries and Veins, pp. 555—558.

5. ULCERS WITH SPECIFIC ACTION.

By a specific ulcer, is implied one which is complicated with some peculiar morbid action, owing to the state of the constitution, or to the disposition of the part affected. The varieties of such ulcers are almost numberless, and baffle description. Scrofulous and venereal sores are specific; cancer, and lupus, or the *noli me tangere*, are also of a specific nature. Some of the inveterate ulcers, into which many venereal sores change, after the syphilitic action has been destroyed, are probably specific: they are mentioned in the chapter on the venereal disease.

Ulcers occur on the instep and foot, with a very thickened edge, and a diseased state of the surrounding skin, very similar to elephantiasis in appearance. Sir E. Home observes, that he has several times met with them in the servants of opulent families, who had led indolent lives, and lived freely.* In cases of this sort, he recommends the *hydrargyrus sulphuratus ruber* to be used as a fumigation. In some instances, an ointment composed of calomel and hog's lard, or of the *ung. hydrarg. nit.* mixed with camphor, is said to answer better than any other application. According to the same authority, a class of irritable ulcers, situated in the vicinity of the ankle, attended with enlargement of the joint itself, and surrounded with a degree of thickening, are much benefited, by poultices and fomentations, containing the *conium maculatum*, (hemlock.)

There is a kind of ulcer, which does not extend more deeply than the cutis, but spreads in all directions. The specific morbid action does not continue in the parts which have ulcerated, but only affects the edge of the skin where the ulcer is increasing; for, the surface first affected heals, while the parts beyond are in a state of ulceration. For such ulcers, of which there are several varieties, a solution of the *argentum nitratum* is the best application.

The last specific ulcer which I shall here notice, is the *fungated* one. It is seen on the calf of the leg and sole of the foot, shooting out a fungus from the surface. The new-formed substance is extremely broad, and narrow at its root; it is tender, and bleeds from very slight causes. The disease, in its origin, somewhat resembles a scrofulous affection of the

* See Practical Obs. on Ulcers of the Legs, by Sir E. Home, p. 299. 2d Edit.; and Hodgson on Diseases of Arteries and Veins, p. 560.

metatarsal bones, until the skin ulcerates, and the fungus protrudes.

One species of this ulcer contaminates the lymphatic glands in the course of absorption; another kind does not do so. The first case cannot be cured by the internal and external use of arsenic; the second may.*

* {A peculiar kind of ulcer attacking the eyelids and face, and incurable except by extirpation, is described by Mr. Jacobs, in the Dublin Hospital reports, vol. iv. 1827. Mr. Jacobs met with three cases, which had existed for four, nine, and twenty-three years;—he thus describes it.—

“This disease may be observed under two very different conditions, either in a state of ulceration, or in a fixed state, in which no progress is made towards healing. In this latter condition the parts present the following appearances: the edges are elevated, smooth and glossy, with a serpentine outline; and are occasionally formed into a range of small tubercles or elevations; the skin in the vicinity is not thickened or discoloured. The part within the edges is in some places a perfectly smooth, vascular, secreting surface, having veins of considerable size ramifying over it; which veins occasionally give way, causing slight hemorrhage; in other places, the surface appears covered by florid, healthy-looking granulations, firm in texture, and remaining unchanged in size and form for a great length of time. The surface sometimes even heals over in patches, which are hard, smooth, and marked with the venous ramifications to which I have alluded. This healing may take place on any part of the surface, whatever may be the original structure: in one case the eyeball itself, denuded as it was by ulceration, was partially cicatrized over. When the ulceration commences, it proceeds slowly, cutting away all parts indiscriminately which may be in the direction in which it spreads: the surface in this state is not so florid, and presents none of the glistening or granulated appearance above noticed: the pain is generally greater at this period. It appears also that there is a tendency to reparation, exclusive of the cicatrization which I have mentioned; there is a deposition of new material, a filling up, in certain places, which gives a uniformity to the surface which should otherwise be very irregular, from the nature of the parts destroyed. When the disease extends to the bones, they sometimes exfoliate in scales of small size, but more generally they are destroyed, as the soft parts, by an ulcerative process. The discharge from the surface is not of the description called by surgeons unhealthy or sanious, but yellow, and of proper consistence; neither is there more fetor than from the heathiest sore, if the parts be kept perfectly clean, and be dressed frequently. There is no fungous growth, nor indeed any elevation, except at the edges, as already noticed, and even this is sometimes very inconsiderable. There is no considerable bleeding from the surface, and when it does occur, it arises from the superficial veins giving way, and not from sloughing or ulceration opening vessels: sometimes the surface assumes a dark gangrenous appearance, which I have found to arise from the effusion of blood beneath. I have not observed that the lymphatic glands were in the slightest degree contaminated, the disease being altogether extended by ulceration from the point whence it commences.

“After the preceding description it is scarcely necessary to state additional arguments to prove that the disease is peculiar in its nature, and not to be confounded with genuine *carcinoma*, or with the disease called *lupus* or *noli me tangere*. From the former it is distinguished by the absence of lancinating pain, fungous growth, fetor, slough, hemorrhage, or contamination of lymphatics; from the latter, by the absence of the furfuraceous scabs, and inflamed margins, as well as by the general appearance of the ulcer, its pro-

CHAPTER XXIII.

ENCYSTED TUMORS

ARE composed of a cyst, in which is contained a matter, extremely various in its appearance and consistence. Sometimes it is soft; sometimes quite fluid; and, in other instances, hard, and even ossified. When it is of the latter kind, the cyst occasionally bursts, and the indurated contents gradually protrude, so as to cause the appearance of a horn. In St. Bartholomew's hospital, I once saw a complete horn removed from the scrotum by Sir J. Earle: its formation and growth perfectly corresponding to the foregoing statement.

In the British Museum is preserved a curious specimen of a horn, which grew from a woman's head, and, in all probability, was formed by a process similar to that which I have mentioned. In Sir Astley Cooper's possession is a still more remarkable specimen, which was given to him by Dr. Roots, and which, in shape and size, bears a close resemblance to a ram's horn! It also grew from the head, and had been preceded by a smaller horny excrescence, about three inches long, which fell off spontaneously. In the removal of the larger

gress, and history. It is equally distinct from the ulcer with cauliflower-like fungous growth, which occasionally attacks old cicatrices."

Mr. Abernethy has seen the simple ulcerative absorption, without any attempt at restoration of the parts, in two cases; in one "the ulcer began near the inner angle of the eyelid, and destroyed progressively the eyelids and the whole contents of the orbit, except the eyeball with its vessels and nerves. The globe retained its natural form; the front was dry, horny, and of a brown colour. In this case, so long as I had an opportunity of observing it, no attempt at reparation was ever made; as in the former, also, there was scarcely any discharge, and the exposed surface had not a very unhealthy aspect; the ulcerative process, however, was here accompanied with extreme pain. It had continued for several years." There is another kind which he describes as "peculiar ulcers which frequently occur on the toes, and sometimes on the fingers. The skin surrounding these ulcers is thickened and of a dusky hue. The surface of the sore is smooth, and of a tawny colour, and discharges fetid sanies or ichor. These sores, in general, spread under the nail, which, consequently, is detached, commonly coming away in portions. These sores are so extremely painful through the night, that they prevent sleep; during the day they do not cause so much suffering. I have known them to continue for two years, unaltered by a great variety of applications, and yet readily get well when arsenic was employed." The wash he employs, consists of $2\frac{1}{2}$ grs. of the arseniate of potash dissolved in $3\frac{1}{2}$ oz. of rose water, and $\frac{1}{2}$ oz. of dilute spirits. }

one, Dr. Roots was careful to remove the whole of the cyst, and no return of the disease ensued.*

When the contents of an encysted swelling are fluid, like honey, the tumor is named *meliceris*; when of a pappy quality, *atheroma*; when fatty, *steatoma*. The feel of an encysted tumor is soft or hard, according to the nature of its contents, the consistence of which, however, cannot always be ascertained by the touch, especially when the cyst is exceedingly thick, firm, and elastic, like parchment or cartilage. It usually contains only one cavity, which is occasionally intersected by partitions. Steatomatous tumors are sometimes composed of distinct contiguous cysts, which may be easily separated from each other. Atheromatous swellings on the head and back usually have very thick firm cysts: while the cysts of similar swellings on the face are generally much thinner.

Encysted tumors are mostly situated immediately under the skin, but, occasionally, they form in deeper situations. Those of the steatomatous kind frequently attain an enormous magnitude. Ordinarily, they are not at all painful. At first, they are constantly moveable, and probably would continue so, if all external pressure were kept from influencing them; but, in time, they generally become more fixed, in consequence of being adherent to the skin and subjacent parts. According to Sir Astley Cooper, a dark coloured spot may often be noticed on the skin in the centre of the tumor, in an early stage of the disease, and such spot he describes as the sebaceous matter obstructing the orifice of a cutaneous follicle; the circumstance, to which his observations lead him to ascribe the origin of the swelling.†

Many persons have a predisposition to encysted tumors: more than twenty have been met with in one patient,‡ and particular families are much troubled with them. Such swellings are common enough in most parts of the body; but, on the head, they occur with particular frequency. I have seen them oftener in this situation, than any other. Mr. Hey has noticed the frequency of atheromatous tumors upon the heads of adults. He had seen the scalp almost covered with them. In children, the atheroma often occurs on the face, forming tumors about the size of a pea, which are smooth, and appear

* See Surgical Essays by Sir A. Cooper and B. Travers, part ii. p. 234. In the Phil. Trans. vol. lxxxi. p. 95, &c., may be seen an interesting paper by Sir E. Home, explaining the manner, in which certain horny excrescences are produced.

† See Surgical Essays, part ii. pp. 230—236, &c.

‡ Practical Obs. on Cancer, by J. Howard, p. 2.

rather whiter than the skin. These, after a time, inflame and burst, the contents are discharged, and the part commonly heals. Hence, the complaint is generally left to take its own course. When such atheromatous swellings take place, as they often do on the eyelids, and particularly, when they are near the eyelashes, they may excite ophthalmia, and occasion opacity of the cornea. Hence, their extirpation is the most prudent measure. The late Mr. Hey used to make an incision into them, in the direction of the fibres of the orbicularis muscle, press out the contents, and then extract the cyst with a pair of forceps.*

Encysted swellings have sometimes been dispersed by strong discutient applications like brine, the lotion of muriate of ammonia, &c.; but, this success is very rare. Even if it were in our power more frequently to bring about the absorption of what is contained in the cyst, this itself would still remain, and its extirpation be requisite.†

Another practice has consisted in letting out the contents of the swelling by a puncture, and then obliterating the cavity of the cyst by pressure. But there is always some risk in irritating encysted tumors, and cases are to be met with in the records of surgery, proving, that such diseases are, in this manner, very capable of being converted into fungous and inveterate ulcers, as bad as carcinoma.‡

However, from cases, referred to by Sir Astley Cooper, one or two of which he was so polite as to show me, it appears, that many encysted tumors, which have a black spot, or little aperture in their centre, may be prevented from becoming larger, and giving any serious trouble, by merely introducing a probe occasionally into the opening, and pressing out the contents of the swelling.§

The common mode of removing encysted tumors, consists in dissecting them out, without wounding the cyst.|| If the latter accident occur, the contents frequently flow out, the cyst collapses, and the continuance of the dissection is attended with more difficulty. It is also a great desideratum to remove every particle of the cyst, and, hence, it is satis-

* Practical Obs. in Surgery, pp. 517, 518. Edit. 2.

† Some very good observations on the general inefficacy of internal and external medicines, for the removal of encysted swellings, and on the advantages of an early recourse to the scalpel, have been published by Loder. See his *Chirurgisch-Medicinische Beobachtungen*, Erster Band, p. 205, et seq. 8vo. Weimar, 1794.

‡ See Abernethy's *Surgical Works*, vol. ii. pp. 115. 119.

§ See *Surgical Essays*, part ii. p. 239.

|| See NOTE M.

factory to take it out entire, that is, without wounding it. When any portion remains behind, the wound will frequently not heal, in consequence of the growth of fungous granulations from it. Unless the swelling be large, a single incision through the skin is sufficient, but, in other instances, it is advantageous to make two cuts in this manner (); first, because they facilitate the removal of the tumor; secondly, because they prevent a redundance of skin which might serve as a lodgment for matter.

After the operation, the edges of the wound are to be brought together with sticking plaster, and a compress and bandage applied.

Instead of the usual method, Sir Astley Cooper prefers making an incision into an encysted swelling, and then pressing its sides together, so as to avert the cyst, when its removal is easily completed.



CHAPTER XXIV.

GANGLIONS.

A **GANGLION** is a small hard tumor, unattended with pain, and composed of a cyst, which is of a firm tendinous texture, connected with a subjacent tendon, and filled with a fluid resembling the white of an egg. It is usually more or less moveable beneath the skin; its growth is slow, and it is seldom much larger than a hazel-nut. Its figure is commonly round, smooth, and even; it seldom inflames, and still more rarely does it suppurate; but, when the latter event happens, an ill-conditioned ulcer is generally produced.

Ganglions occur most frequently on the hands and fingers, and either over a tendon, or ligamentous expansion, with which the sac is connected underneath. But, there are instances of these tumors making their appearance in many other situations, and they sometimes attain a considerable magnitude. A ganglion has been known to cover the whole back part of the neck.* These tumors appear sometimes to be the consequence of a bruise, or violent sprain. Occa-

* Cases in Surgery, by Joseph Warner, p. 163. edit. 4.

sionally they move along with the tendon, to which they are attached ; while, in other instances, they seem fixed.

Deformity, and impediment to the use of some particular muscle, are the utmost inconveniences commonly resulting from this disease, but when the tumor ulcerates, a very foul, and even dangerous ulcer may be the result.*

The common plan of treating ganglions is to apply pressure, or stimulating applications to them, with a view of causing them to be absorbed. Binding a piece of lead on the tumor with a roller, is an usual method ; and, when the stimulating plan is preferred, the *oleum origani*, or hartshorn, may be used as a liniment. The two methods are frequently practised together. Many ganglions may also be reduced by blisters kept open directly over them. It must be acknowledged, that these modes of treatment are frequently tedious, and the benefit produced by them too often only temporary.

Supposing, however, all attempts to disperse a ganglion ineffectual, and the parts to be disabled, in consequence of the size and situation of the tumor, ought the surgeon to advise the extirpation of the disease? According to my judgment, he ought ; for daily experience proves, that accidental wounds of tendons and ligaments commonly terminate well ; and that ganglions may be safely cut away, when they are obstinate and troublesome, is fully proved by numerous cases.† Here it is as necessary to remove the whole of the cyst, as in a case of ordinary encysted tumor.

An effectual method of curing ganglions is to strike them with the back of a book, &c. so as to rupture the cyst, and cause the contents to be diffused in the adjacent cellular substance. I have known many instances of the success of this practice, which is frequently adopted by Sir Astley Cooper.‡

When other plans fail, Sir Astley Cooper sometimes lets out their contents with a needle, and he has never seen inflammation, or any serious consequence, excited by such practice.§ Dr. Currie also cures them by drawing the skin to one side, and then making an oblique opening into the cyst with a couching needle, so that the contents of the swelling may be pressed into the cellular membrane. A compress and bandage are then applied ; and, if necessary, the operation repeated after a few days.||

* See Medical Journal, vol. v.

† See Warner's Cases, pp. 165. 170. edit. 4. Gooche's Chirurgical Works, vol. ii. p. 376. Heister's Institutions of Surgery, part ii. p. 171.

‡ See Medico-Chirurgical Transactions, vol. ii. p. 339.

§ See Medico-Chir. Trans. vol. ii.

|| See Edinb. Med. Journ. No. 84.

CHAPTER XXV.

SARCOMATOUS TUMORS

ARE SO named, when they are not contained in regular globular cysts, like encysted swellings, and are of the consistence of flesh : being composed of various substances, which more or less resemble ordinary fat, the human pancreas, the mammary gland, the medullary matter of the brain, cartilage, the spongy texture of the gums, &c. However, in all these cases, it is only a degree of resemblance, since a tumor, really like the pancreas, the mammary gland, &c. in texture, is never met with. A very ingenious classification of tumors, founded upon the likeness of their structure to that of particular organs, or, in other words, upon their anatomical structure, was some years ago published by Mr. Abernethy,* who employs the terms *common vascular*, or *organized sarcoma* ; *adipose sarcoma* ; *pancreatic sarcoma* ; *mammary sarcoma* ; *medullary sarcoma* ; *cystic sarcoma* ; *tuberculated sarcoma* ; &c. according to the texture, which the swelling most resembles, or as it happens to contain cysts, or to consist of an aggregation of tubercles. All these and other varieties of sarcoma are found, not merely to differ in the appearances of their texture, when examined out of the body, but also in regard to their general progress, severity, and danger, while connected with the patient. Thus, the cases named *common vascular sarcoma*, and *adipose sarcoma*, are simple diseases, free from all malignity, occasioning but little pain, or inconvenience, except what arises from their weight, or pressure ; but, several of the other kinds, especially the *tuberculated sarcoma*, and the *medullary*, now better known by the name of *fungus hæmatodes*, and described in a future chapter, are marked by their peculiarly intractable character, by a strong propensity to recur, and by an inseparable connexion with a certain diathesis, always tending to produce similar diseases in various parts of the body, and to destroy life. At all events, if there be any exceptions to this statement, they are very rare. Scirrhus, and cancer, sometimes named *carcinomatous*

* Surgical Works, vol. ii. p. 261, &c.

sarcoma, are also distinguished by their malignity, and form the subject of the ensuing chapter.

Most of the varieties of sarcoma, may not only occur as distinct swellings in the midst of original textures, with which they even sometimes have but a slight connexion, but may take place in original parts themselves, which form as it were the frame-work for them, undergoing enormous changes in size, consistence, and even shape, though the primitive shape of the organ always continues for a time to influence that of the swelling. Besides the classification of tumors, according to the resemblance of their consistence and texture to those of certain organs, and substances, with which the anatomist is familiar, the French have suggested another, founded upon the elementary tissues into which they may be finally resolved, in the same way as Bichat applied this mode of examination to the natural structure of the body. It is asserted, that all swellings are reducible to about seven morbid tissues, each of which has a peculiar structure, always presenting the same characters, whatever may be the part, in which it happens to be situated. Sometimes these textures are found unmixed; sometimes, blended and variously combined, to the number of two, three, or four.*

Fatty tumors, often termed also *lipomatous*, or *adipose*, are formed by an accumulation of fat, in a limited, and generally very circumscribed extent of the cellular substance. The structure of adipose sarcoma is absolutely the same as that of the adipose substance, such as it appears to be in those situations where fat naturally collects; with this difference, however, that the interstices of the cellular membrane, thus affected, are of considerable size, and obviously enlarged. The integuments, which are distended, and rendered much thinner than natural, constitute a sort of sac, spread over the mass of fat, of which the tumor is composed, nothing appearing to be interposed between them and the swelling itself, if we except a very thin capsule, that is slightly connected with the substance of the tumor by means of many small vessels. There are some cases, where the partitions of cellular membrane, forming the cavities in which the fat is deposited, are thicker, and more compact, than in the natural state; and when a section is made of such a tumor, the exposed surface presents a marbled appearance, of a yellow and white colour.

Fatty swellings are frequently of an oblong pyramidal

* See Dict. des Sciences Med. t. iii. p. 340, where the names and other particulars of these tissues may be found.

shape, and have a narrow pedicle, which is itself of a fatty texture; but, sometimes they have a base, which is as broad as the whole mass of the tumor. They are met with in persons of all ages; but are most frequent in adults. The shoulders, the back, and the neck, are particularly common situations for them. Their occurrence, however, is so frequent, that there are few surgeons who have not had opportunities of seeing them in almost every region of the body. They are disposed to grow to a very large size, which, however, they may not attain till after they have continued many years. Instances are recorded, in which they weighed, after their removal, from forty to nearly fifty pounds. Particular individuals seem also to have a strong disposition to their formation, as is proved by the existence of many of them at once in different parts of the body, a remarkable specimen of which is described in Walther's publication.*

Sometimes adipose tumors are formed in parts, in which there is naturally but a small quantity of fat: thus, in warm climates, the scrotum is often prodigiously enlarged by a deposition of fatty matter, and Delpech has seen a fatty swelling in the labia pudendi, the structure of which is very different from fat.† Sometimes adipose swellings are formed betwixt the peritoneum, and the parietes of the abdomen, in which circumstance the tumors make their way outwards under the integuments, drawing along with them the part of the peritoneum to which they are attached. Such cases are improperly named by some of the French writers "*herniés graisseuses*."

Adipose tumors generally grow in a regular, slow, and progressive manner; their vessels are neither large nor numerous. Hence their removal is attended with little danger from hemorrhage, and they are easily separated from the surrounding parts. When they have been inflamed, however, the detachment is more difficult.

The shape and slow growth of adipose tumors might suffice to indicate their nature; but they present other characters, amongst which the consistence of the mass of the swelling deserves particular notice. These tumors are not elastic, but have a peculiar soft feel, resembling what is perceived on handling a bag filled with cotton. Their surface is unequal; but the irregularities, which are distinguishable through the thin integuments, have no firmness, and are obliterated by compres-

* Ueber die angebohrnen Fetthautgeschwulste und andere Bildungsfehler, p. 29. Fol. Landshut, 1814.

† Précis Elem. des Mal. Chir. t. iii.

sion. These circumstances, however, are only strongly marked in such adipose tumors as have not yet acquired an immense size, and remain free from every complication. When the swelling has become exceedingly large, its weight, its magnitude, its pressure on the surrounding vessels and integuments, materially obstruct the circulation, and oedema then taking place between the skin and adipose substance, the consistence of the latter may appear to be increased. A surgeon of experience, however, will yet be able to detect the inelastic softness, which is peculiar to all fatty tumors. Any previous attack of inflammation may also harden the parts around an adipose sarcoma, and even cause ulceration: a state which should never be confounded with cancer.

Adipose tumors, though large, may continue a great many years, without producing any pain, or inconvenience, provided they remain free from irritation. They may grow with more or less rapidity, or may remain of the same size for a very long time; but they have never been known to disappear spontaneously, and (except in a few instances in which they have been made to slough and ulcerate by caustic and stimulating applications, a plan on every account to be reprobated) all attempts to disperse them invariably prove ineffectual.

Every kind of fleshy tumor, every enlargement of an original part of the body, can only be the effect of some change in the action in the vessels. Whatever matter is deposited in the interstices of a gland, or any other part, must be placed there by those secerning arteries, which, in the healthy state, secrete exactly a sufficient quantity of new particles to supply the old as fast as they are removed by the absorbents. Thus the action of the secerning arteries, and that of the lymphatics, ought to be equal; and whenever more matter is deposited by the blood-vessels, than is taken away by the absorbents, a tumor forms in the disordered part. It is possible to conceive, however, that when original parts are enlarged, the morbid change may be owing to an imperfect absorption, and not to any wrong action of the blood-vessels. But in cases of tumors, which are quite distinct, and which constituted no original part of the body, the formation of the disease is probably always the result of a morbid state of the surrounding arteries.

The process by which sarcomatous tumors, and indolent indurations and thickenings, are formed, is sometimes referred to *chronic inflammation*; but, whether this doctrine be correct, or not, little or nothing is known about the causes of the growth of the generality of fleshy tumors. In fact, we

know not what the particular circumstances are, which invariably precede and give rise to whatever change it may be in the action of the blood-vessels, or that of the lymphatics, which leads to the formation of a fatty, or fleshy tumor. We know not what it is that causes the secerning arteries to deposite too much, or the absorbents to remove too little. Neither do we understand, why, in one case, the swelling should consist of fat; in a second, of a fleshy substance; in a third, of medullary matter, &c. unless we be content with the explanation that the cause depends upon diathesis, predisposition, &c. which is leaving things, in reality, unexplained.

It is usually supposed, that coagulating lymph is the first kind of matter, which is thrown out from the vessels, in the early stage of sarcomatous tumors; and that it afterwards becomes vascular itself, and is converted by the action of its own vessels into the various kinds of morbid structure already mentioned. In proportion as a tumor increases in size, it compresses the surrounding cellular substance, which is converted into a kind of membranous capsule. However, in sarcomatous cases, the cyst is generally thin; and, sometimes, there is even no cyst whatever.

The growth of indolent tumors does not disturb the constitution; they form in an insidious manner, without increased heat, and generally without any uneasiness in the part; and most of them are disposed to become gradually larger and larger.

Surgeons are not only ignorant of the particular causes of the growth of various fatty, fleshy tumors, they also know of no effectual means, by which the progress of the disease can be stopped, and the patient freed from the inconveniences of continually bearing about with him a mass of redundant matter, which in a chronic state is both a deformity and an oppression; in an inflamed or ulcerated state, is a source of severe pain and even of dangerous mischief; and in certain malignant forms, the frequent occasion of death, preceded by unusual sufferings. It has been conjectured that topical bleeding and cold applications would check the growth of sarcomatous tumors; but experience teaches us to place no dependence upon the plan. Attempts have also been made to promote the absorption of the new formed substance by means of mercurial frictions, blisters, electricity, and stimulating discutient applications. These methods, however, are not recommended by many examples of success; and they are attended with some risk of irritating the tumor, without lessening it, in which case the disease sometimes changes from an indolent quiet form to an irritable state, in which it inflames,

enlarges, ulcerates, emits fungi, and assumes a character as intractable and dangerous as that of cancer itself. I believe, that the only kind of swelling, which does not present these risks, is the common adipose one: at least, I have never seen it change into a malignant disease. When local stimulating applications succeed, it is usually by their inflaming the whole swelling, and causing it to ulcerate and slough. This, however, when it answers, is on the whole a more severe method than extirpation with the knife, and often induces alarming constitutional illness, to which the patient sometimes falls a victim. I remember a man, who had a considerable sarcomatous tumor, extending from the angle of the jaw over the side of the neck; the late Mr. Ramsden, by means of stimulants and escharotics, succeeded in making it ulcerate; but the disease now put on so aggravated an appearance, with incessant darting pain, fever, delirium, &c. that the patient did not live beyond three or four days from the period when the tumor began to ulcerate and slough.

For the reasons which have been explained, the practice of trying to disperse indolent sarcomatous tumors, is not deserving of praise. The removal of the disease by the knife is the best measure, and the sooner it is done the better; for a common adipose tumor, now about the size of an apple, and capable of being extirpated with the utmost safety, may, in the course of a few years, become so large as to weigh from fifteen to twenty or thirty pounds; and the magnitude of the wound, necessarily made in cutting out so large a mass, may prove highly dangerous and even fatal. Besides, sarcomatous tumors, when removed in an early stage, are less apt to leave the surface of the wound complicated with any impediments to a radical cure.

When the tumor is known, at the time of the operation, to be either a mammary, a tuberculated, or medullary sarcoma, care should be taken to make a free removal of the surrounding substance.

The operation is performed in the same way as that of removing a diseased breast, to the chapter on which subject the reader is referred.

CHAPTER XXVI.

OF CANCER.

IN the present imperfect state of our knowledge of cancer, the greatest difficulty, in determining many of the most important questions concerning it, undoubtedly arises from one term embracing numerous forms of disease. While some authors confine the name of cancer to one kind of case, as, for instance, to a disease capable of contaminating other parts, either by direct communication, or through the medium of the absorbents, and when it approaches the skin, producing in it small tumors of its own nature,* others have no scruple in calling nearly every induration a scirrhus, and every intractable ulcer a cancer. Nay, a splendid modern work has appeared, in which are minutely described the symptoms and characters of six different species of cancer, to each of which a particular name is assigned.† When different authors, therefore, are speaking of cancers, they are not always speaking of the same disease, and it is by this fact, that the discordant statements about the effects of remedies, and the possibility of a cure, are to be reconciled.

The cases adduced by Sir E. Home, support the opinion, that cancer is at first entirely a local disease; a doctrine, however, about which the best authorities still disagree. They also tend to prove, that cancer is not a disease which immediately takes place in a healthy part; but is a distemper, for the production of which the part must have undergone some previous morbid change. Thus, pimples, small tumors, or warts, upon the nose, cheek, or prepuce, remain for ten, fifteen, twenty, or thirty years, without producing the smallest inconvenience; but, at the age of sixty or seventy, upon being cut in shaving, bruised, or otherwise injured, change into cancers. The same doctrine is also corroborated by the many indolent tumors of the breast, which remain quiet for years; but, on being irritated by accidental violence, become cancerous.

Cancer is said to prevail in particular families, and is still

* Home's Obs. on Cancer, p. 146. 8vo. Lond. 1805.

† See *Nosologie Naturelle, ou les Maladies du Corps Humain distribuées par Familles*, par J. L. Alibert. tom. i. p. 540, &c. fol. Paris. 1817.

regarded by some of the latest writers as an hereditary complaint.* We are not to understand, however, that this is so much the case, that because a mother has the disease, her children must necessarily be afflicted with it.

Cancer is rather a disease of old, than of young persons. Exceptions undoubtedly occur. Sir E. Home mentions an instance of cancer in the breast of a young lady aged fifteen. The true cancerous structure, however, is seldom seen under the age of twenty-five or thirty.† What used to be regarded as cancer of the eye, and is frequent in children, clearly appears from the observations of Mr. Wardrop to be, in reality, fungus hæmatodes of that organ. Cancer scroti, however, sometimes, but not commonly, presents itself in young lads.

Cancer is most prone to attack the female breast and the uterus. It seldom affects the breasts of the male sex, though I have seen one example that was supposed to be such; and also another case, which, though it resembled cancer externally, had not internally the carcinomatous structure; but, if possible, was a worse affliction, being complicated with a general disease of the glands, in the course of the abdominal aorta, which were immensely enlarged, and changed into a greenish substance, much like turtle. Cancer often invades the testes, lower lip, penis, and tongue, the skin, and other parts of a glandular structure. Though women are less frequently afflicted with cancerous lips, they are, on the whole, much more subject to cancer than men: a fact, accounted for by the change of the constitution at the cessation of menstruation, a change, found materially to promote its commencement, and by the uterus and mamma being the parts on which the distemper is most disposed to make its attack. In women, accustomed to menstruate in large quantity, the uterus is frequently attacked when that evacuation ceases. In unmarried females, and those who have not had children, the breasts often become the seat of the disease, about the same critical period. However, as Sir A. Cooper has remarked, pregnancy and suckling do not always prevent the complaint, of which he knew one woman die, who had been pregnant seventeen times, and had ten living children.‡

* Pearson's Principles of Surgery, ed. 2. p. 225. Alibert professes the same opinion, and mentions a lady who died of cancer of the uterus, whose mother and grandmother had both perished of the same disease. See *Nosologie Naturelle*, &c. t. i. p. 556.; also Bayle in Dict. des Sciences Med. t. iii. p. 677. Sir A. Cooper, in Lectures, vol. ii. p. 187.

† Wardrop on Fungus Hæmatodes, p. 189.

‡ Lectures, vol. ii. p. 186.

The disease is more malignant in some situations, than others. When it commences in the skin, its progress is said to be generally slower than when it begins in the mammary gland, and its effects on the health less rapid. Relapses are more common after the extirpation of a cancerous breast, than after that of a carcinomatous lip, or a scirrhus testicle. It is even said, that a part of a scirrhus tonsil may be left behind; and yet the circumstance will not hinder the patient from receiving material relief, since cancerous ulceration is, in this instance, not disposed to break out with ungovernable malignity, as usually happens when a portion of other cancerous tumors is left. I believe, however, that most indurations of the tonsil are not really scirrhus, but scrofulous.

According to M. Roux, the skin, cellular substance, mucous membranes, glandular secreting organs, and, perhaps, lymphatic glands, are the only parts capable of being primarily affected with cancer;*† and though it is its nature to extend to a great many structures, this is consecutively and by propagation. Thus it never begins in muscles, serous membranes, tendons, cartilages, &c.

Mucous membranes are more frequently the primary seat of cancer, than the skin. To this place must be referred such cancers of the eye as begin on the conjunctiva, cancers of the nasal cavities, tongue, œsophagus, stomach, bladder, uterus, penis, and rectum.

Cancer of glandular secreting organs is alleged by M. Roux to be more circumscribed than in any other structure, and this may be the case in the testis; but, in the mammary gland, the scirrhus structure, which will be presently described, soon branches out into the surrounding part of the breast, so that the limits of the disease cannot be so readily comprehended, as the mere feel of induration might lead us to suppose. According to M. Roux, cancer never first commences in the lachrymal gland, but extends to it from the eye; and the salivary glands are also never affected but secondarily. The breast and testicle, he says, are the only glands exposed to the primary attack of the distemper. In the two last organs, the disease is more constantly, than in mucous membranes, preceded by the state called scirrhus.

M. Roux believes, with Mr. Pearson, that cancer of the lymphatic glands is, perhaps, always a secondary affection.

* Mémoire renfermant quelques Vues Générales sur le Cancer, in Œuvres Chir. de Desault par Bichat, t. iii.

† See NOTE N.

Mr. Wardrop, however, has seen two primary cancerous affections in lymphatic glands; similar cases have been met with by Mr. Abernethy,* and Klein once extirpated a very large original scirrhus of a lymphatic gland, situated upon the serratus major anticus, to which it adhered so intimately, that it was necessary to cut away a portion of the muscle with the swelling.†

In general, whenever the skin is near the focus of the distemper, it is in it that the first vestiges of the extension of the disease are manifested. The organization of the skin may already have suffered, and the surface of the tumor be ulcerated, while the whole swelling may still be moveable, and the disease not have extended itself at all to the muscles, or other subjacent parts.

When cancer affects organs covered with a serous membrane, the latter part is affected only in an advanced period of the disease. Thus scirrhus of the pylorus exists a good while, without the peritoneum being diseased. Cancerous affections of the testicle prevail a long time without the tunica vaginalis becoming affected.

The blood-vessels seem to withstand the ravages of all kinds of ulceration longer than other organs; a fact exemplified in cancer,‡ as well as other cases; for, though the fungous growth, produced in the imperfect attempt at cicatrization, frequently bleeds profusely from the slightest causes, hemorrhage is not often occasioned by the extension of the ulceration, not even when it denudes a considerable artery.

In a cancerous affection of long duration, the lymphatic glands, with which the diseased part communicates, usually swell. The same thing sometimes happens in the very commencement of the disease, while the part is only in the state of scirrhus. In cases of scirrhus breast, the axillary glands enlarge; but, it is remarked, that if the disease be on the sternal side of the nipple, the gland, just above the clavicle at the lower part of the neck, is hardened, as the disease is then extended by the absorbents, through the intercostal muscles, to the internal mammary absorbent vessels and glands.§

In the majority of cancerous diseases, the skin has a yellowish or lead-coloured tinge, and is dry and scaly. In advanced cases, the bones are frequently deprived of a good deal of their organized part; the calcareous matter predominates in

* See Wardrop on Fungus Hæmatodes, p. 188.

† Chirurgische Bemerkungen, p. 262.

‡ Dict. des Sciences Med. t. iii. p. 549.

§ Sir A. Cooper's Lectures, vol. ii. p. 178.

them; and they become so brittle, that they break from the patient's merely turning in bed; a fact, of which there are many well-authenticated examples on record.

Some patients soon fall victims to the disease; while others lead a long life of misery and suffering. A few individuals, in whom the distemper becomes almost stationary, suffer little more than the anxiety and disgust inseparable from it. The younger the patient is, in whom a truly cancerous disease occurs, the more rapid are generally its advances. When a scirrhus breast occurs in very old persons, it does not generally shorten life, or rather it is more correct to say, that they often live several years with it, and finally die of some other complaint.* The progress of the disease may be accelerated by an unhealthy residence, mode of living, painful emotions of the mind, wrong treatment, &c.

"Mental trouble," says a distinguished surgeon, "has the worst effects upon scirrhi: in consequence of this, I have seen a small indolent scirrhus, of twelve years' standing, enlarged to the size of an apple in three weeks, attended with intolerable shooting pains, and, in seven weeks, become an open cancer."† Hence, when once an operation is decided upon, he recommends it to be performed as soon as possible, as the fear of it is likely to produce, in a very short time, the worst consequences.

Many writers refer all the phenomena of a cancerous diathesis to a virus, which they suppose to be formed in the seat of the disease, and thence conveyed by absorption over the whole system; a doctrine, rejected by M. Roux on the following grounds:—the lymphatic glands are often affected, while the disease is only in the state of scirrhus, and before any matter is formed. Such glands are sometimes not affected for years after the existence of the disease; a circumstance that seems inconsistent with the notion of an active poison. We possess no proofs, that cancerous matter is infectious, when applied to a sound person, or capable of producing a disease similar to that by which it was formed.‡ MM. Bielt, Lenoble, Fayet, and Alibert, inoculated themselves with the ichorous matter which exuded from a horrible fungous cancer of the breast; but without any ill consequences.§ Some surgeons have not thought it always necessary to remove, with a scirrhus breast, the axillary glands, when they are dis-

* Sir A. Cooper's Lectures, vol. ii. p. 185.

† Chr. Klein. Chirurgische Bemerkungen, p. 259. 12mo. Stuttgart, 1801.

‡ Pearson's Principles of Surgery, edit. 2. p. 259.

§ Alibert. Nosologie Naturelle, &c. p. 558.

cased,* and, no doubt, the swelling of such glands may sometimes be the mere effect of irritation or sympathy. I may observe, however, that this cannot be the case, when those parts exhibit, as they frequently do after their removal, the same scirrhus texture as the breast itself. M. Roux also argues, that if the symptoms of a cancerous diathesis depended upon the impression of a cancerous virus on our organs, it would matter little whether the poison originated in this or in that part, and cancers of the uterus and breast would not be sooner fatal than those of the skin. Some women, reduced to the last stage of weakness, have been permanently cured by the removal of cancerous breasts.

If a cancerous virus existed in the constitution, M. Roux inquires, why does not cancer of other parts always follow the removal of those already diseased? Why do secondary operations frequently succeed? Why does the application of caustic to a livid fungous part of the wound, after the operation, sometimes completely prevent the threatened recurrence of the distemper?† Experience, I believe, will justify the explanation, given by M. Roux, of the cause of many relapses; namely, that the parts, in the vicinity of the cancerous affection, were, at the time of the operation, in a state of disorganization, though undiscoverable by the most attentive eye. The circumstances, revealed in the dissection of a scirrhus, also strengthen this explanation. But this mode of accounting for relapses should be qualified, as nothing is more certain, than that cancer often breaks out again in distant parts, and that its origin, though often excited by local irritation, must always be joined with some peculiarity of constitution, without which no kind of irritation will produce the complaint. Thus, when the diathesis prevails, the extension of the disease along the lymphatics, and to their glands, may be the consequence of simple irritation from sympathy, or from another kind of irritation, connected with the quality of something that is absorbed in the diseased part. This doctrine

* "Once (says an excellent surgeon) I was obliged by a profuse bleeding to leave the operation unfinished, and not remove some very indurated axillary glands; but, during the treatment, they disappeared, a circumstance which their hardness did not allow me to entertain the least expectation of." *Chirurgische Bemerkungen, von Chr. Klein, p. 263, 12mo. Stuttgart, 1801.* I have lately heard of several instances, in which hardened glands in the axilla, left after the removal of diseased breasts, have subsided and given no trouble. I am far from meaning to say, however, that these glands should never be removed; on the contrary, I have seen the true scirrhus texture as strongly marked in them, after their removal, as in the mammary gland itself, whatever might be the mode in which it was extended to them.

† P. J. Roux, in *Œuvres Chir. de P. J. Desault, par X. Bichat, tom. iii*

is quite independent of all theory about a specific cancerous virus, or its universal diffusion in the system.

OF SCIRRHUS, OR CANCER, PREVIOUSLY TO ULCERATION.

I have always considered scirrhus as a diseased hardness, in which there is a propensity to cancerous ulceration, and a greater backwardness to recede, than exists in any other kind of diseased hardness, although the skin may occasionally not break during life, and a few scirrhus indurations may have been lessened.

The puckering of the skin, the dull leaden colour of the integuments, the knotted and uneven feel of the disease, the occasional darting pains in the part, its fixed attachment to the skin above, and muscles beneath,* and in the breast, the retracted state of the nipple, generally accompanied with declining health, and a peculiar sallow complexion, form so striking an assemblage of symptoms, that, when they are all present, there cannot be the smallest doubt, that the tumor is a true scirrhus.

But, the diagnosis is frequently more obscure. In some cases, scirrhus is moveable, and not fixed to the subjacent parts; and the disease may be indolent, without much pain, or without discoloration of the skin. In the female breast, the part first affected may be very small, and feel like a loose pea under the skin; in other instances, it may be more extensive and deeply situated. Neither is the swelling always irregular and craggy.

The pain of a scirrhus breast, which generally extends to the nearest shoulder, and often to the nerves of the arm, is commonly most severe a little before the period of the menses, by which evacuation it is lessened again.†

A scirrhus induration rarely happens in patients under thirty, and seldom acquires the magnitude, which the generality of other tumors are disposed to attain, when their growth is not interrupted. Other tumors, especially when they have not been inflamed, are commonly more moveable than scirrhi.

If we except fungus hæmatodes, other tumors do not involve every kind of structure, skin, muscle, cellular substance, &c.; and the integuments seldom become affected before the

* In advanced cases of cancer in the breast, the disease is frequently not only adherent to the pectoralis major, and intercostal muscles, but even to the ribs. See Howard's Pract. Obs. p. 18.

† Sir A. Cooper's Lectures, vol. ii. p. 177.

distention, produced by their size, is very considerable. In scirrhus cases, the skin soon becomes contaminated, discoloured, and puckered; and, in the breast, an early symptom is a retraction of the nipple; owing to the lactiferous tubes being drawn out of their course by the swelling.*

Some few tumors may be harder and heavier, than a few scirrhi; but, the reverse is commonly the case. In a scirrhus of the breast, the part affected is generally hard, heavy, and connected with the mammary gland; and, when moved, the whole gland moves along with it.† The nipple, besides being retracted, is also frequently inflamed and excoriated. The cellular membrane also becomes hardened, and little tubercles form in the absorbent vessels under the integuments.‡

In parts which have become scirrhus, the structure usually consists of a very firm, light brown substance, intersected by membranous or ligamentous septa, which run in various directions. The membranous septa are more numerous, and of greater thickness in some cases than others. A cartilaginous substance is occasionally mixed with this structure. The whole structure sometimes resembles a piece of common cartilage, softened by maceration. Sometimes cysts, containing a serous fluid, are formed in scirrhi, particularly those of the testicle and breast; but they are also frequently absent. A substance, possessing the common characters of scirrhus, has been known to be converted into a kind of bony matter.§ When a section of a scirrhus is made in an early stage, the centre is found more compact, harder to the feel, and of a more uniform texture, than the rest of the tumor, and is nearly of the consistence of cartilage. This middle part is not larger than a silver penny; and from this are seen white ligamentous bands, passing to the circumference of the disease, in every direction, like rays. In the interstices, between these bands, the substance is different, and it is less compact away from the centre. Transverse ligamentous bands, of a fainter appearance, are likewise perceptible, forming a sort of net-work, in the meshes of which the new-formed substance is enclosed.

When the disease is further advanced, the whole mass has a more uniform structure; no central point can be distinguished; the external edge is more defined; and the ligamentous bands are more visible, running with great irregularity.

* Sir A. Cooper's Lectures, vol. ii. p. 178.

† Obs. on Cancer by Sir E. Home, p. 156.

‡ Sir A. Cooper's Lectures, vol. ii. p. 178.

§ Dr. Baillie in a letter inserted in Adams's work on the Cancerous Breast.

When the disease has proceeded to cancerous suppuration, which, however, does not invariably precede the formation of an outward sore, a small irregular cavity is found, filled with a bloody fluid, and having ulcerated, jagged, and spongy sides. Beyond these there is a radiated appearance of ligamentous bands; but the tumor near the circumference is more compact, and consists of distinct portions, each of which has a centre, surrounded by ligamentous bands, in concentric circles.

In some instances, there is no appearance of suppuration, or ulceration, in the centre of a scirrhus; but a cyst is found filled with a transparent fluid, and having a fungus projecting into the cavity.*

The most characteristic mark of a scirrhus is this intersection of its structure with white ligamentous bands. It is to be regretted, that the existence of such texture cannot be detected till the disease has been removed. Every surgeon should be well apprized, that these membranous septa frequently extend a good way into the surrounding fat; for, the circumstance dictates, in the strongest manner, the necessity of removing a considerable portion of the substance at the circumference of every scirrhus swelling.

Sometimes cysts, of moderate or very minute sizes, containing a transparent fluid, and supposed by Dr. Adams to be hydatids, are found in the substance of scirrhi; but such cysts are not so frequently attendant on the complaint as to form any essential part of its character.† Cancer may also arise under conditions, in which there cannot possibly be any hydatids concerned; for example, when a wart is torn off, and a cancerous sore is the result, the ulcer is only situated at the base of the excrescence, where there is never any hydatid. Himly‡ and Mr. John Burns§ have never been able to detect in cancerous parts any thing like hydatids; and Meckel|| makes nearly the same declaration.

The dilatation of the superficial veins around scirrhus swellings is not peculiar to them; but attends many other tumors.

* Sir E. Home, pp. 157—159. Also Baillie's *Morbid Anatomy*; Abernethy's *Surgical Works*, vol. ii.; and Meckel's *Handbuch der Pathol. Anatomie*, Bd. 2. Abth. 2. p. 338.

† Home, p. 160.

‡ *Journ. der Praktischen Heilkunde*, 1809. st. 12. s. 126.

§ *Dissert. on Inflammation*, vol. ii. p. 445. 8vo. Glasgow, 1800.

|| *Handbuch der Pathologischen Anatomie*, Bd. 2. Abth. 2. p. 355.

OF CANCER IN THE STATE OF ULCERATION.

The time when a scirrhus ulcerates is very uncertain; sometimes a long time, even many years, elapse before this change occurs; and sometimes it never happens at all, the patient dying with the complaint still in the form of scirrhus. However, the diseased skin, covering a carcinomatous tumor, generally ulcerates before the swelling is very large. A large chasm is then produced in its substance, partly by sloughing, and partly by ulceration. A copious discharge of very fetid, sanious matter, follows. The ulcer becomes irregular in its figure, and unequal on its surface. The edges are thick, and indurated, and often have a serrated appearance, being sometimes retorted, at other times inverted. The ulcer sometimes spreads with rapidity to a great extent, and the fungous mass, generally soon formed, is the source of frequent hemorrhages, which, joined with the irritation of the disease, reduce the patient to the lowest state of debility. Granulations are generally formed on the ulcerated surface, when the ravages of the disorder seem to undergo a temporary stop; but this apparent attempt at reparation only ends in the formation of an inveterate fungous substance. The surface of the sore feels hard, like the original tumor, and is remarkably insensible of pressure. In some places, the granulations rise up considerably; while, in others, scarcely any at all are produced; but they always differ from common healthy granulations in their hardness, their insensibility, and their secretion, which is generally a bloody serum.*

Generally, while the skin remains free from ulceration, though the health may be seriously disturbed, and severe attacks of pain be occasionally felt, the patient is not dangerously reduced; but no sooner does ulceration take place, than an immediate deterioration of the health is noticed. However, this sudden change does not constantly happen, much depending on the quickness or slowness of the disease, its situation, magnitude, &c. However, sooner or later, in every case, after ulceration has taken place, the countenance changes for the worse; debility, loss of appetite, a cough, with tightness of the chest, and difficulty of breathing, come on: the bowels are sometimes constipated; sometimes relaxed; and very distressing sickness and vomiting affect many patients, who at length sink into extreme emaciation and weakness.†

* Sir A. Cooper's Lectures, vol. ii. p. 179.

† Howard, p. 25.

The time when the lymphatic glands become affected, is subject to great variety. Carcinoma of the breast is most apt to contaminate the axillary glands, several of which becoming diseased, the function of absorption cannot be duly carried on in the arm, so that, in bad cases, the hand, fore-arm, and, in time, the whole of the limb, up to the shoulder, are swelled with an incurable kind of œdema. Occasionally, the lymphatic glands towards the clavicle are the only ones affected; and in a few instances, those towards the sternum are alone diseased. In advanced cases, the disease mostly extends to the pectoral muscle. Instances are also recorded in which the cancerous disease of the breast extended to the pleura and lungs.* The pressure of a diseased lymphatic gland on one of the axillary nerves, may cause excruciating agony. A fever has been known to occasion a mortification of a cancerous breast, and, had the sphacelus embraced all the contaminated parts, and the patient been less reduced, it seems probable that a cure might have followed.† The celebrated Mademoiselle Contat is said to have been suffocated by the tumefaction of the cellular substance about the throat, in consequence of an enormous cancer of her breast.‡

TREATMENT OF SCIRRHUS AND ULCERATED CANCER.

The treatment of scirrhus embraces two objects; first, the dispersion of the tumor, or induration, by means of internal and external medicines, diet, &c.; secondly, the extirpation of the diseased parts with caustic, or the knife.

With respect to the dispersion of any truly cancerous tumor, that is to say, one in which the really scirrhus texture exists, I am decidedly of opinion, that it is a thing which is never accomplished; and that if the benefit to be derived from an operation be put out of consideration, such disease is incurable, and for the most part fatal. The cases, forming an

* Hist. d'une Résection des Côtes et de la Pleûre lue à l'Acad. Royale des Sciences de l'Institut de France le 27 Avril, 1818, par le Chev. Richerand: in *Nouv. Journ. de Médecine, Chirurgie, et Pharmacie*, par Beclard, Chomel, &c. tom. ii. Mai, 1818. See also the account of a case which was in the Hotel-Dieu at Marseilles, where "not only the whole breast was destroyed, but also the axillary glands, the surrounding cellular substance, the pectoral muscles, and some portions of the ribs; so that when the patient died, the pleura costalis, much thickened, formed the bottom of the ulcer in several places." See *Dict. des Sciences Med.* t. iii. p. 548.

† For cases proving the foregoing statements. See *Obs. on Cancer* by Sir E. Home, pp. 55. 59. 64. 76. 86. 91.

‡ Alibert *Nosologie Naturelle, ou les Maladies du Corps Humain distribuées par Familles*, p. 543. fol. Paris, 1817.

exception to this general truth, are said to be three. 1. Not only true scirrhi, but even ulcerated cancers, have been known to be so extremely slow in their progress, that they have lasted an immense number of years, without having apparently contributed to the abbreviation of life. 2. Mortification, which is one of the occasional fatal terminations of cancer, may sometimes, though very rarely, prove a means of cure. The whole of the tumor has been known to separate by the effects of gangrene, and the ulcer thus produced speedily heal up, like one of a simple nature.* 3. Another event, still more rare, is the actual cicatrization of an ulcerated cancer, while the subjacent scirrhus mass has not been destroyed, either by gangrene or any surgical operation.† But I may observe, that if such change were to take place, the patient could not be considered out of all danger, because the remaining scirrhus might ulcerate again, or even prove fatal, without being converted into an open cancer.

Dr. A. Monro, senior, appears to me to have shown more discrimination than many of his cotemporaries, when he gave it as his opinion, that the resolution of a cancer was a very rare occurrence; but that, as he had seen two swellings of this nature, or *at least what he supposed to be such*, cured, he would not take upon himself absolutely to deny its possibility.‡ Certainly it would be unphilosophical to assert, that the resolution of a cancer is utterly impossible; but if a single well-authenticated example of it, amongst several thousands of cases, cannot be found, at all events, such a termination may be regarded as not in the natural course of things, and we should act, just as if it were altogether impossible.§

When the hardness is so situated as to be easily removed with the knife, no delay should be occasioned by attempting to disperse a swelling of this nature, because an early operation affords the best chance of effectual extirpation. The means, employed in the endeavours to disperse a true scirrhus, are tedious in their operation, often injure the health, and when of an irritating nature, and incautiously applied, convert the tumor into a cancer. The operation can be prudently postponed, and discutient remedies tried, only when doubts

* See Bulletin des Sciences Médic. par la Société Méd. d'Emul. Cahier de Dec. 1810, et Sept. 1811.

† Dict. des Sciences Méd. t. iii. p. 555, and Obs. de M. Nicod in Bulletin de la Faculté, &c. No. I. ann. 1810.

‡ Edinb. Med. Essays, vol. v. art. 32.

§ Dict. des Sciences Med. t. iii. p. 556.

exist of the disease being a true scirrhus, with the peculiar texture already described.

There are various diseases of the breast, which somewhat resemble cancer; and besides encysted tumors, and different sarcomatous swellings, mentioned in a former chapter, surgeons frequently meet with other affections, which may be mistaken not only for an indolent scirrhus, but even for the painful form of this complaint, and ulcerated cancer itself. If the true nature of such cases be not ascertained, we may suppose, when we are treating only a simple chronic inflammation, or some other benign form of disease, that we are treating a really cancerous complaint, and ascribe to the virtues of the medicines a cure, which would frequently be produced by nature alone. These mistakes have had as much influence, as credulity and quackery have had, in conferring a temporary reputation upon specifics for cancer. Were these milder diseases also not discriminated, we should be continually giving unnecessary alarm, by pronouncing them to be scirrhi, and even perform needless operations. Some of these examples, however, though free from malignancy, cannot be cured without the knife.

1. In young women under thirty, one breast is often rather larger and more tender than the other, especially about the period of the menses.* When, in such persons, this evacuation is by any cause considerably checked, or suppressed, one or more indurations may form in one or both breasts.

This case is described by Sir A. Cooper, under the name of the *irritable tumor of the breast*, on account of its great tenderness and painful nature. The uneasiness extends to the shoulder and axilla, and frequently down the limb to the fingers. When the pain is most severe, vomiting is produced. The skin over the part retains its natural colour. The same experienced surgeon states, that the disease is frequently attended with profuse, or scanty menstruation, and often with fluor albus. Its causes he refers to irritability of constitution, and a wrong state of the uterine secretion. A blow sometimes operates as the exciting cause.

The treatment consists in applying to the part the extract of belladonna; opium mixed with ceratum cetacei; the extractum conii or fresh hemlock in a poultice; a plaster of soap cerate; a piece of hare-skin, or oiled silk. When the pain is very urgent, and the breast unusually full, leeches are useful. The internal medicines are directed to the restoration of the

* See NOTE O.

proper state of the uterine secretion ; and those preferred by Sir A. Cooper, are calomel and opium joined with mild aperients ; the *mistura myrrhæ cum ferro* ; the *ferrum ammoniatum* ; rhubarb and soda with columba ; and conium joined with rhubarb.*

2. Sir Astley Cooper also gives an account of what he calls *simple chronic tumor of the breast* ; a case resembling the indolent form of pancreatic sarcoma, described by Mr. Abernethy. It occurs in young patients of healthy appearance ; grows very slowly, is at first superficial, extremely moveable, has the feel of a conglomerate tumor, and does not affect the absorbent glands. It cannot be cured without an operation ; but it is quite free from malignancy.†

3. After acute inflammation of the breast, a deep-seated, uneven hardness, often remains, which, when irritated by any accidental cause, becomes painful, of a livid red colour, and so like an occult cancer, as frequently to be mistaken for it. These are the kinds of cancer, which are alleged to have been cured by bleeding, the repeated application of leeches, emollient and narcotic applications, low regimen, &c. One of the principal characters by which the previous cases may be detected, is, that they are all of them more or less painful on being handled ; while a true scirrhus is not so, not even at the period when the lancinating pain has begun in it, provided it be uncomplicated with an attack of inflammation.‡

4. The *hydatid tumor of the breast*, described by Sir A. Cooper, and so named from its containing cysts of the nature of hydatids, is at first unattended with pain, and is not so hard, nor so distinctly circumscribed, as scirrhus. The skin over the part is not discoloured, and the health is unaffected, even when the swelling has attained a great size. In time, a part of it presents a manifest fluctuation. The tumor is pendulous, and the whole breast very moveable, though the disease may be bulky. The case is painful, only when the cysts are inflamed. The absorbents are never diseased. When a cyst ulcerates, or is opened, serum, blended with mucus, or a little matter, is discharged ; and the aperture then heals ; but the tumor returns. This form of disease occurs at all ages after twenty ; but more frequently in old subjects. It appears to correspond to the *cystic sarcoma* described by Mr. Abernethy, except that it is not at all malignant, and never returns

* Lectures, vol. ii. p. 216.

† Vol. cit. p. 211.

‡ Dict. des Sciences Med. t. iii. p. 558.

after removal, which is the only mode of cure. However, when the cyst is single, a puncture, and exciting the adhesive inflammation so as to obliterate the cavity, will sometimes produce a cure.*

5. The breasts are subject to swellings of a scrofulous nature, which at first bear a resemblance to indolent scirrhi, and afterwards to ulcerated cancer. They are said particularly to occur between the age of puberty and the thirty-sixth year, and in women, who, though not evidently scrofulous, have thick lips, broad flat noses, &c. M. Bayle has often seen them cured by tonics, the extract of conium, the alkalies, and other anti-scrofulous medicines, after the disease had continued more than a year. When the swelling was painful, emollient poultices were applied, and sometimes camphorated liniment. The tincture of iodine internally, and ung. hydriodatis potassæ externally, might here also be tried with advantage. The ulcers, originating from these swellings, sometimes present thickened everted edges; their circumference is of a lead-coloured, or reddish hue; the veins seem dilated, and fungous granulations are produced. In short, they are the strongest likenesses of ulcerated cancer. The age and constitution of the patient; an attentive inquiry into the nature of the pain, discharge, &c., will throw some light upon the diagnosis, and all other doubts will soon be dispelled by the good effects of anti-scrofulous remedies.

6. Swellings often form in the breast, very soon after delivery, in consequence of a milk abscess, or inflammation: but though hard and firm, are commonly nothing more than chronic inflammations, arising in individuals, whose constitutions are somewhat influenced by the state of the secretion of milk. They may generally be successfully treated by exhibiting the compound decoction of sarsaparilla, and employing resolvent remedies.

The following medicines have been most recommended in cases of cancer.

1. Hemlock, or conium maculatum, was highly praised by Storck.† Two grains of the extract were given at night and in the morning, and the doses were sometimes gradually increased to as much as a dram and a half or two drams in the day. The very circumstance of all Storck's cases being represented as cures, might alone have raised suspicions as to the accuracy of his accounts, had not his high reputation operat-

* See Sir A. Cooper's Lectures, vol. ii. p. 163, &c.

† Libellus de Cicuta, Vindob. 1760.

ed as a pledge of the truth of his assertions. Subsequent experience has proved, however, that he erred, as a great many other eminent men have done, in consequence of his having confounded with cancer, diseases of another nature. He saw cases get well, which he *supposed* to be cancerous, and he ascribed every thing to the medicine. De Haen declares, that out of 120 cancerous patients, who tried conium, not a single one was cured; and of eight women with cancers of the uterus, to whom he administered hemlock on Storck's plan, not one obtained a recovery. Fothergill, Akenside, and Kirkland, in England; and Bierken, in Sweden, reaped no better success from the exhibition of conium. Most of these writers, however, acknowledge its usefulness in resolving scrofulous, and some other indurations. Such was also the opinion of Cullen.* Lastly, Dr. Alibert, tried Storck's plan on more than 100 women afflicted with ulcers of the uterus, and other cancerous diseases, without finding the least benefit result from it.† Whether conium ever renders the progress of these cases slower and less painful, is a point, on which different opinions are entertained.

2. Small doses of the extract of belladonna have been found sometimes to lessen the pain of cancerous diseases;‡ but all idea of its being capable of curing them is universally renounced. The same report may be made respecting aconitum, the aqua laurocerasi, and stramonium.§

3. Acetite of copper is the principal ingredient in the remède de Gerbet, and Gerbier's pills, two famous nostrums in France, for cancerous swellings and ulcers. Impartial investigations have proved, however, that it produces no good effects in such cases; but, that some instances of *noli me tangere* (lupus) got well while the patients were taking it.

4. Arsenic was proposed as a certain cure for cancers, by M. Lefebure de St. Ildefond.|| His preparation was white arsenic, or acid of arsenic, of which four grains were dissolved in a pint of distilled water. Of this solution, the patient took at first every morning one table-spoonful, in an equal quantity of milk, sweetened with syrup. At the end of a week, if no unpleasant effects arose, a second dose was given every even-

* *Materia Med.* part ii. chap. 6.

† *Dict. des Sciences Med.* t. iii. p. 662. *Nouv. Elém. de Therap.* t. i. p. 425. *Nosologie Naturelle*, &c. t. i. p. 558.

‡ *Sir A. Cooper's Lectures*, vol. ii. p. 193.

§ *R. Ext. Stramonii*, gr. ʒ. *Camph. gr. ij.* *M. ft. pil. bis terve die sumenda.* The formula directed by Sir A. Cooper.

|| *Remède éprouvé pour guérir radicalement le Cancer*, &c. 8vo. 1775.

ing, and, after a fortnight, three doses were taken every 24 hours. When the first bottle had been exhausted, another was prepared with six grains of the arsenic, and the third bottle, which was the strongest ever used, contained eight grains. The ulcer was also bathed, and washed with a liquid composed of eight grains of arsenic, in a pint of distilled water, and afterwards covered with a poultice made of carrots, which had been boiled in a similar solution, to which the acetite of lead, laudanum, and the extractum conii were added in various proportions. This author assures us, that he had by these means cured thirty confirmed cancers, in the course of fifty years' experience. Justamond's reports were also highly favourable to arsenic, as a remedy for cancer.* On the other hand, Acrel in Sweden, Metzer in Prussia, B. Bell in Scotland, Pearson in England,† and Desgranges of Lyons, found arsenic inadequate to the cure of cancer, while its deleterious effects in many instances made its discontinuance necessary. No reliance is now put on it, as a remedy for really cancerous diseases, though the testimonies in favour of its good effects in lupus, and other inveterate ulcerations of the skin and lips, are strong and respectable.‡

5. Preparations of iron have been recommended by Mr. Carmichael of Dublin.§ He employed the carbonate, the oxyphosphate, and suboxyphosphate of this metal, in doses of from 30 to 60 grains in the day, aloes being given to obviate costiveness. He also used the carbonate as a topical application. Five cancerous ulcers of the face are reported to have been thus cured. It would have been more satisfactory, had these cases not been reputed cancers of the face, diseases which are in reality generally, if not always, very different from specimens of the true scirrhus, or carcinomatous structure. We know that many of these affections are only instances of lupus, or *noli me tangere*, and that, in their worst forms, they will often yield to the external and internal use of arsenic, conium, stramonium, and other alterative plans, such as the compound decoction of sarsaparilla, with Plummer's pills, &c.

6. Preparations of mercury have been so often tried and found ineffectual, and even hurtful,|| that little need be said

* An Account of the Methods pursued in the Treatment of Cancerous and Scirrhus Disorders, &c. 8vo. Lond. 1780.

† Principles of Surgery, p. 277. edit. 2.

‡ See Klein's Chirurgische Bemerkungen, p. 264.

§ Essays on the Effects of Carbonate and other Preparations of Iron upon Cancer, 2d edit. Dublin, 1809.

|| Pearson's Principles, p. 277. edit. 2.

about them. Mercurial frictions, we well know, are amongst the best means for dispersing most indolent swellings, which admit of resolution. They also produce a change in the system, which, like any other alterative, will frequently make obstinate and troublesome sores heal. These effects are the foundation of the notion, that some really cancerous affections have been cured by mercury.

7. Muriate of barytes was proposed by Dr. Crawford; of his three cases, however, only one is allowed to have been cancerous: it was a cancer of the penis, which, notwithstanding some temporary appearance of improvement from the medicine, ultimately proved fatal. The other cases are considered by MM. Bayle and Cayol to have been in reality scrofulous. Pinel and Alibert also confirm the inefficacy of the muriate of barytes in cancer.*

8. Repeated bleeding has been highly recommended, as a means of curing cancer, in particular, by Valsalva† and Fearon.‡ The latter applied leeches every two or three days, unless the bites caused too much irritation, and he used also the cold lotion of the acetite of lead. In cancerous affections of the uterus, and internal organs, he practised venesection, and, he assures us, that repeated bleedings always have the effect of lessening the pain in the latter stages of disease, when opium and hemlock give no relief. Of the utility of general and topical bleeding, when true cancerous diseases are complicated with common acute or chronic inflammation, no doubt can be entertained; but experience will not warrant the conclusion, that they have the power of curing either true scirrhus or cancer. All the alleged cures have in truth been cases of another nature. According to an experienced surgeon, tumors arising from cold yield most readily to the repeated use of leeches, while those which are more indolent, and connected with a languid constitution, give way to hemlock or mercury.§

9. Living altogether on milk, or on a regimen just sufficient to support life, as first proposed by Pouteau,|| has been

* Dict. des Sciences Med. t. iii. p. 665; Nouv. Elém. de Therap. t. i. p. 498. Nosologie Naturelle, p. 558.

† De Sed. et Causis, Morb. Epist. 39. art. 35.

‡ Treatise on Cancers, with an Account of a New and Successful Method of Operating, &c. 8vo. Lond. 1786. This novelty consisted in the plan of bringing the sides of the wound together, and healing it by the first intention. The principles which Alanson applied to amputation, Fearon extended to operations for cancer.

§ Sir E. Home on Cancer, p. 154.

|| Œuvres Posthumes, tom. i.

found to retard the malady. A strict vegetable diet, the avoidance of fermented liquors, and the use of nothing but distilled water, in every thing which is taken as drink, have also been recommended.* But although some favourable reports have been made of the effects of such treatment, its power of completing a cure is not much credited, and, I observe, that Sir A. Cooper, in his lectures, is by no means an advocate for it.

10. With respect to opium, its utility is limited to alleviating the pain and misery of cancerous diseases, and procuring rest.

11. Various mineral waters, blisters, and issues† are mentioned by writers; but all idea of their power to cure cancerous diseases is now universally renounced.

I next proceed to the consideration of topical remedies.

1. Arsenic put on cancerous ulcers acts as a caustic, and destroys the parts. In a few days, all the ulcerated surface is converted into an eschar, on the separation of which the remaining sore sometimes heals. But, in other examples, the application brings on dangerous symptoms, colic, shivering, vomiting, syncope, &c. and even death. Fernel tells us of a woman who had a cancer of her breast, to which a mixture of arsenic and corrosive sublimate (oxymuriate of mercury) was applied: she died in six days, with symptoms indicating that she had been poisoned. With a view of preventing such disasters, arsenic has therefore been generally mixed with other less deleterious ingredients, such as dragon's blood, cinabar, &c. These compositions are moistened, and made into arsenical pastes. Modern surgeons seldom venture to apply arsenic to true carcinomatous ulcers, because its irritation is sure to do infinite harm, unless the whole of the diseased parts admit of being destroyed by it, which rarely happens. If the parts are to be extirpated, the knife is the surest, safest, quickest, and least painful means. If, however, arsenic is not to be advised as a topical application for true cancers, it deserves trial in cases of lupus or noli me tangere, and other reputed cancerous ulcerations of the skin, lips, and other parts of the face.

2. Caustic potassa, the nitrous and sulphuric acids, the nitrate of silver, even the actual cautery itself, can only cure cancer on the principle of a complete destruction of the dis-

* See Lambe's Reports on the effects of a peculiar Regimen on Scirrhus Tumors, &c. Abernethy's Surgical Works, vol. ii. Classification of Tumors, p. 93.

† Flajani, *Collezione d'Osservazioni e Riflessioni di Chirurgia*, t. i. p. 275.

eased parts; a plan which is always uncertain of accomplishment, and if not completed, must dangerously aggravate the disease. I have seen several patients die in the course of four or five days, in consequence of the violent indisposition brought on by the application of caustics to cancers and other anomalous diseases.

3. The liquor plumbi acetatis alone, or mixed with laudanum, spirit of wine, and camphor, is a common application. The late Mr. Ramsden often used it for indolent swellings of the breast; but, the cases which I saw successfully treated by him in this way, were certainly not real scirrhi. Sir E. Home adds his testimony, however, in confirmation of the application sometimes actually dispersing tumors which resemble scirrhi.* The employment of the diluted liq. plumbi acetatis, and leeches, by Mr. Fearon, has been already noticed.

4. Opium, cicuta, belladonna, and other narcotics, have been extensively tried as topical applications, in the form of plasters or laudanum, to scirrhi; and of laudanum, lotions, fomentations, and poultices to ulcers. With the exception of laudanum for sores, these narcotics are, perhaps, nearly as safe as any dressings which can be used, because they are not likely to create irritation.

5. The carrot poultice is one of the safest dressings for cancerous sores, and has long been in frequent use in England. However, the idea of its being able to cure such diseases, is not retained by any honest or judicious surgeon.

6. Preparations of iron have been praised as topical applications; viz. a solution of the sulphate of iron, \mathfrak{Zj} to \mathfrak{Hj} of water, or covering the surface of the sore with a paste made of arseniate, or carbonate of iron† moistened with water. It is far from being proved, however, that these applications have answered, except for phagedenic ulcers, cases of lupus, &c.

7. Amongst a great variety of topical remedies which have been suggested, but not found effectual, I shall only mention the following: the fresh bruised plant of the house-leek; the juice of the berries of the *phytolacca americana*, or the extract; a mixture of \mathfrak{Zss} of the juice of *digitalis* in \mathfrak{Hj} of water; the gastric juice of animals; fermenting poultices; olive oil; various discutient plasters; electricity.

* On Cancer, p. 154.

† Carmichael, Essay on the Effects of the Carbonate and other Preparations of Iron on Cancer, &c. 8vo. Dublin, 1809, edit. 2.

8. The long-continued application of cold running spring water.*

9. Whatever doubts may be entertained about the prudence of venturing to try several of the local remedies to which I have adverted, all surgeons now seem to agree about the propriety of retaining a scirrhus in an equal temperature, and as much as possible defended from accidental violence. With these views, it is usual to advise patients to keep the swelling covered with a piece of swan's-down, or rabbit's-skin, soap plaster, oiled silk, or belladonna plaster.

10. Methodical pressure was a few years ago strongly recommended. The only essential part of this plan is the compression of the cancerous tumor, gently at first, and with a force gradually increased, till at last it is augmented to a very great degree. If the cancer be open, the cavities are filled up with finely levigated chalk, and all the surface thickly covered with hair-powder, over which long straps of plaster are put, so as to cover the whole surface of the tumor. Compresses are then laid on, and the whole firmly bound down with a long roller; or over the first straps are laid a second set, bracing the parts more firmly than the first; next a plate of lead; and lastly a roller carried round the chest. With respect to the merits of the plan, it appears from investigations made at the Middlesex Hospital, that the specific action of cancer is not subdued by pressure, and that it accelerates the coming on of the last fatal symptoms. "It frequently gave so much pain, that the patients could not, after repeated trials, endure it, under any modification whatever; and often it appeared to hasten the fatal event." We learn, "that in the scirrhus tumors, the disease advanced, rendering extirpation necessary in two instances; in six others, the disease passed into ulceration, assuming the usual malignant appearances, and terminating in death."†

In truly carcinomatous affections, the removal of the whole of the diseased parts with a knife, when they admit of being thus entirely cut away, is the measure by which the patient is sometimes fortunate enough to be permanently relieved. Many delicate and difficult considerations occur, however, in this part of practice. In most cases, the whole of a cancerous breast can be completely removed; the operation is neither difficult nor dangerous in itself; the wound resembles any other simple wound; and it generally heals up very well.

* Alibert, *Nosologie Naturelle*, &c. t. i. p. 561.

† Surgical Obs. by C. Bell, vol. i. pp. 4—11.

But, unfortunately, in a certain proportion of cases, the disease, sooner or later, recurs in the same or some other part of the body, and, as some writers urge, generally in a much more violent form than before the operation.

But it cannot be doubted that some writers, who have been led by this fact to reprobate the operation altogether, have carried their mistrust in the resources of surgery too far; and De Houppeville himself, who condemns the operation, seems to have succeeded by this means in curing four women who were afflicted with occult or ulcerated cancers; and many similar cures are upon record, in some of which the patients remained perfectly free from the disease, at periods exceeding twenty and thirty years after the operation.* If, however, we suppose (as I think we are bound to do,) that amongst these and other histories of the same nature, some of the tumors extirpated were not really cancerous, we cannot reasonably extend this opinion to the whole of the cases in question; and the number to be regarded as true scirrhi, is still large enough to show the impropriety of an absolute rejection of the operation.

The accuracy of the three following propositions seems unquestionable. 1. After the extirpation of a scirrhus tumor, whether the disease be indolent or painful, or small or recent, there is no certainty that the disease will not recur. 2. Neither is it certain that the disease will return, even when it has made considerable progress. 3. The more recent the disease is, the less the chances are of relapse.

As soon, therefore, as a tumor is considered to be a real scirrhus, the earlier the operation is performed the better. We know of no other plan which holds out as good a prospect of relief, and though not exempt from the possibility of failure, it frequently succeeds. It is also declared by high authority, that when the patients undergo an alterative course of medicine, as soon as they have recovered from the operation, relapses are less frequent, than in former days.†

When, however, the patient has several cancerous affections, a case which is unusual, or is of very advanced age, which generally renders the disease indolent, the knife should not be employed, the operation should not be done.

When the extent and situation of the disease are such as to

* Vacher, *Diss. sur le Cancer des Mamelles*, pp. 119—174, 12mo. Besançon, 1740; *Mém. de l'Acad. Royale de Chirurgie*, t. iii. pp. 25—40; Sabatier *Médecine Opératoire*, t. ii. p. 335. edit. 1. Unzer, *Gazette Salulaire*, Mars, 1791. Hill's *Cases in Surgery*, 8vo. Edinb. 1772.

† Sir A. Cooper's *Lectures*, vol. ii. p. 198.

render the removal of the whole of the morbid parts impracticable, the operation, of course, must not be attempted. The partial extirpation of a true scirrhus, whether by caustic or the knife, is sure to convert the distemper into a malignant ulcerated cancer, and hasten the patient's death. Hence, in no operation is the aim at quickness more dangerous, and the maxim of "*sat cito, si sat bene*," should never be out of the surgeon's mind. Above all things, a free removal of the skin, covering and adjoining a scirrhus, and of the surrounding fat, is highly advisable.

Sometimes, however, notwithstanding all possible precautions to cut away every particle of the disease, the wound, instead of healing up, changes into a cancerous ulcer. Every prudent surgeon, therefore, should ensure his own reputation by making a guarded prognosis.

When the axillary glands are diseased, the surgeon is to remove them, as soon as he has taken away the scirrhus of the breast. A fact, however, to which I have already adverted, merits attention; viz. cases have occurred, in which the axillary glands, though very much enlarged and indurated, were not in a scirrhus state; but merely inflamed from irritation.* In such examples, Louis, Desault, Klein,† Assalini, and Soemmering,‡ have successfully extirpated cancerous breasts, without removing the axillary glands. As, however, it is scarcely possible to know beforehand, whether the glands are simply inflamed, or truly cancerous, we should undoubtedly make it an invariable rule to take away all such as are swelled and hardened. After the removal of a cluster of diseased glands from the axilla, a swelling of the arm has been known to ensue, and cause the patient's death.§ According to Sir A. Cooper, if several glands in the axilla be enlarged, their removal will not prevent the return of the disease, because there are others beyond the reach of the knife.||

Camper believed, that a sure sign of the incurability of a cancerous breast, consisted in a shooting pain between the second and third ribs, at the place where the mammary vessels quit the cavity of the chest. He was persuaded, that, when such pains commenced, the cancerous distemper had extended to the lymphatic glands underneath the sternum, which have a communication with both breasts by means of

* Vacher, op. cit. pp. 134—171; Zinn, in Comment. Societ. Gotting. t. i.

† Chir. Bemerkungen.

‡ De Morb. Vasorum Absorbentium

§ Sir E. Home on Cancer, p. 62.

¶ Lectures, vol. ii. p. 200.

absorbent vessels, and, therefore, he deemed the operation too late. In opening women who had had a breast removed, and some of whom lived till the wound was quite healed, Camper found the glands under the sternum changed into cancerous excrescences, which had already made their way through the intercostal muscles, and formed a projection beneath the integuments. No man would be justified, I think, in imitating Richerand, who ventured in one case even to cut away a part of the ribs and pleura costalis itself. The poor patient was trebly remarkable: first, on account of the extraordinary ravages of the disease; secondly, because his case was an instance of a cancerous breast in a male subject; and, thirdly, because he was himself a surgeon, capable of judging of the dangerous nature of the operation to be done upon him. Richerand, in his haste to communicate the history of this formidable excision to the Royal Institute of France, was rather too sanguine in his description of the success which was likely to follow the proceeding; for hardly a month more had elapsed, when tidings arrived of the patient's decease.

In ulcerated cancers, the chances of a cure are less than in cases of scirrhus. However, when the patient is not too far reduced, and the whole of the diseased parts can be taken away, the operation will sometimes answer. Some high authorities may be cited in justification of the operation, even when there is little or no reason to expect the avoidance of a relapse. Thus, Monro says, when an ulcerated cancer is reducing the patient so rapidly that he is likely to be carried off in a very short time by it, we should operate, as the only means of prolonging the patient's days.* And Mr. Abernethy remarks, that the ulceration and self-destroying process of cancer are so horrible, that it may be stated, as an argument for the operation, that a patient gets rid of a quantity of disease upon easier terms by having it removed by the knife, than by suffering it to proceed in its natural course. When the scar or surface of the wound, after the operation, becomes indurated and cancerous, the patient suffers much less pain, and there is much less fetor in the disease thus formed, so that the patient's sufferings are on the whole much diminished;† a remark which perfectly coincides with the experience of a judicious foreign practitioner.‡

Nothing can be a stronger proof of the propriety of operat-

* Edinb. Med. Essays, vol. v. art. 32.

† Abernethy on Tumors, in Surgical works, vol. ii. p. 186.

‡ Klein, Chirurgische Bemerkungen, p. 261. 12mo. Stuttgart, 1801.

ing even upon many ulcerated cancers, than the unexpected radical cures which have been frequently known to follow operations undertaken merely with the view of lessening the patient's sufferings, and extending life for a short period. Thus, Le Cat operated and cured an enormous ulcer, which had rendered one rib carious, and destroyed several of the axillary glands.* Foubert successfully removed both breasts; one of which was scirrhus; the other, deeply ulcerated.†

Another question is, whether we ought to operate more than once upon cases in which a relapse unfortunately happens, supposing the form of the tumor, and its relation to the adjacent parts, should not constitute an impediment to the practice? A relapse is itself undoubtedly one of the most valid arguments against operating, because as the disease has already returned, and we are ignorant of its causes, it may return again. Should the relapse happen, however, in the situation which it previously occupied, the case is not so discouraging as when it attacks other parts; because in the first instance, the return of the complaint may possibly be owing to some undiscovered portion of the disease being left behind; while, in the second, no doubt is left about a constitutional tendency to the distemper.

Sabatier repeated operations for cancer, in two remarkable instances: a woman underwent one operation, which was very severe, owing to the largeness of the tumor. She enjoyed good health for ten years, but having then a relapse, she was operated upon again, and continued well at the end of five more years. The same surgeon operated three times upon an officer's breast, whose health was afterwards very good.‡ M. Lacombe operated four different times upon a woman's breast, who, at the end of five years after the last extirpation, was enjoying perfect health.§

With a view of preventing relapses, Mr. Abernethy strongly urges the propriety of endeavouring, after the operation, to quiet the nervous system, and keep the digestive organs in as healthy a state as possible; and he recommends a mere vegetable diet, with as much milk, broth, and eggs, as is just sufficient to hinder the patient from losing strength.||

Other surgeons, like Klein, Flajani, &c. have confidence in

* Journ. de Méd. 1761, t. iv. p. 258.

† Mém. de l'Acad. de Chir. t. iii. p. 25.

‡ Sabatier, Méd. Opertoire, t. ii. p. 335.

§ Propositions sur le Cancer, Paris, 1805.

|| Abernethy on Tumors, p. 93, in Surgical Works, vol. ii.

issues, which they recommend to be kept open a long time.* Abroad, an idea also prevails, that relapses are less frequent, when the wound is not healed by the first intention, but allowed to suppurate.† As, however, this was the old practice in England, and it had not attractions enough to preserve its ground amongst us, I see no reason for restoring a method certainly attended with numerous disadvantages. Sir A. Cooper recommends a course of alterative medicines.



CHAPTER XXVII.

FUNGUS HÆMATODES.

WE are indebted to Mr. John Burns,‡ of Glasgow, for the first distinct account of this formidable disease, which he called *spongoid inflammation*; and the additional particulars of the subject, subsequently published by Hey, Freer, Wardrop, Langstaff, and others, have afforded a good deal of information respecting the history of the distemper, which is usually regarded as of the same nature as the *medullary sarcoma*, described by Mr. Abernethy. It commences with a small colourless tumor, which is soft, when not covered by an aponeurosis, but firm when situated beneath it. When the disease occupies merely the adipose, or cellular membrane, upon the surface of the muscles, the tumor is not usually painful in its beginning; nor does it impede the motion of the muscles on which it is seated. But when deeply seated in the limbs, it causes pain and weakness of the part affected. Also, when it occurs in the mamma, its growth is attended with considerable pain.§

For a considerable time, the tumor is smooth and even, but afterwards projects irregularly at one or more points, and here the skin becomes thinner, and of a livid red colour. The swelling has a considerable degree of elasticity, yielding to pressure, and rising up again immediately this is taken off.

* Chir. Bemerkungen, p. 264. Collezione d'Osservazioni, &c. di Chirurgia, t. i. p. 207, &c.

† Flajani, Op. cit. t. i. p. 278.

‡ Dissertations on Inflammation, vol. ii.

§ Hey's Pract. Obs. in Surgery, pp. 290, 291. edit. 2.

The sensation of a fluctuation often seems to be so manifest, that the mistaken surgeon plunges a lancet into the tumor, with the intention of discharging the fluid supposed to be present.* An error of this kind is generally a serious one, as a painful bleeding fungus, which rapidly acquires a very large size, shoots out of the opening, and by the irritation and loss of blood which it occasions, soon destroys the patient. But in the natural course of the disease, openings are at length formed in the projecting parts of the swelling, and a thin bloody matter is discharged. Almost immediately after the formation of these apertures, a small fungus protrudes, which rapidly increases both in breadth and height, and frequently bleeds profusely. The discharge is thin, and exceedingly fetid. The integuments round the ulceration are red and tender. The neighbouring glands swell, and assume the spongy morbid structure of the original tumor. If the patient still survives, similar tumors frequently make their appearance in other situations, and hectic symptoms, and repeated hemorrhages, put a period to life.

On examining the affected parts after death, or amputation, the tumor itself is found to consist of a soft substance, somewhat like the brain; membranous partitions intersect it, and there are cells, or abscesses, in various places. The tumor frequently dives between the muscles down to the bones, and is not invariably contained in an entire cyst. The adjoining muscles are of a pale colour, and lose their fibrous appearance, becoming more like liver than muscles. The bones near the tumor are always carious. The disease sometimes appears to be brought on by external violence; but frequently the cause is quite unknown.

Fungus hæmatodes has now been observed in numerous situations and organs, viz. the eyeball, the superior and inferior extremities, the testicle, liver, spleen, kidney, lungs, uterus, ovarium, mamma, thyroid gland, neck, and fauces.

No remedy seems to have the least power in checking this formidable disease; all escharotics, even undiluted oil of vitriol, are incapable of destroying the fungous growths as fast as they are regenerated. Nothing seems to offer a prospect of preserving life, except the early and total removal of the disease with a knife; and, of course, this is not always practicable, on account of the situation of the tumor. When it

* See Wardrop on Fungus Hæmatodes, p. 126. M'Kechnie's Case of Fungus Hæmatodes, in *Edinb. Med. and Surg. Journal*, vol. vii. p. 168. Earle in *Med. Chir. Trans.* vol. iii. p. 60.

can be done, no part of the surface surrounding the tumor should be left, as the disease would certainly recur.

Here, however, it is incumbent on me to state the melancholy truth, that, excepting an instance or two where the eyeball appears to have been removed with the promise of lasting success,* almost every attempt to extirpate the disease, by simply cutting away the morbid part, has failed, the fungus re-appearing with increased malignity. The only cures with which I am acquainted, are a few which were accomplished by amputation of the limb, and are related by Mr. Hey. But, as the observations of the same gentleman prove, even amputation does not always have the desired effect; for, if the distemper has extended itself in the slightest degree to any part of the stump, a relapse appears to be certain.

It is much against the general success of all attempts to extirpate fungus hæmatodes, that the distemper is frequently not confined to one part or organ. Thus, when the disease has appeared on the lower extremity, tumors of the same nature have been observed, after death, situated in the lymphatic glands, along the course of the iliac vessels and abdominal aorta; and when the eyeball has been the seat of the disease, various little spots or tumors, resembling in structure the medullary, or cream-like consistence of fungus hæmatodes in general, have been observed between the cranium and dura mater, and between the tunica arachnoides and pia mater. On the whole, I am inclined to think, with a modern author, that fungus hæmatodes is either originally a constitutional disease, or very soon becomes so.†

Although fungus hæmatodes has generally been confounded with cancer, it is a widely different disorder. Instead of being hard and unyielding, like a scirrhus tumor, it is generally soft and elastic. Instead of being intersected by the same kind of ligamentous fibres or bands, which exist in a scirrhus, fungus hæmatodes consists of a soft pulpy matter, which mixes readily with water, and is hardened by acids, or by being boiled in water. When the skin, or external covering, of fungus hæmatodes gives way, instead of the morbid growth being destroyed by ulceration, as in cancer, a quick-growing fungus arises from it, and the tumor seems to increase with even greater rapidity. This fungus, instead of having a firm texture, like that which sometimes arises from a cancerous ulcer,

* See Hey's Practical Observations, p. 290. edit. 2. Wardrop on Fungus Hæmatodes, p. 8.; and a Case by Wishart, in Edinb. Med. Journ.

† C. Bell, Surg. Obs. vol. i. p. 410.

is a dark red or purple mass, of an irregular shape, and of a soft texture, is easily torn, and bleeds profusely when slightly injured. A primary cancer seems to be confined to few organs and few textures; and while, in some of these, fungus hæmatodes in its primary state has not been seen, it has been detected in other parts, where no true scirrhus structure has ever been met with, as, for instance, the liver, spleen, kidney, and lungs. While cancer also is rather a disease of advanced life; most patients attacked by fungus hæmatodes are young.*

Fungus hæmatodes of the eye, will be described in the second part of this volume.



CHAPTER XXVIII.

OF SYPHILIS; OR, THE VENEREAL DISEASE.

THE venereal disease is generally believed to arise from a specific, morbid poison, which, when applied to the human body, produces effects, either on the part to which it is immediately applied, or on various parts of the system, in consequence of absorption.

The effects, produced on the part, to which the poison is directly applied, are called *primary symptoms*; while those happening in consequence of the virus being absorbed into the circulation, are termed *secondary*.

When the primary symptom is a sore, it is denominated a *chancre*; and when the absorbed matter, in its course towards the circulation, makes the absorbent vessels or glands inflame and suppurate, the latter complaint is named a *bubo*, which likewise generally ranks as a primary symptom, because the virus, which produces it, is only on its way into the circulation, and the swelling is not in reality an effect of the poison, after its arrival in the sanguiferous system.

According to several authors, amongst whom is Mr. Hunter, the primary symptom may also be a discharge of *venereal matter* from the urethra, or from the surface of the nymphæ,

* See Wardrop on Fungus Hæmatodes, chap. xii.

clitoris, meatus urinarius, &c. in women, well known by the name of a *clap*, or *gonorrhœa*.

The earliest or first order of *secondary symptoms* generally consists of ulcers in the throat or skin, or of spots on the surface of the body. The second order comprehends either swellings of the bones, periosteum, and tendons, called *nodes*, or else mere pains in these parts.

In the opinion of Mr. Hunter, gonorrhœa and chancre arise from the application of the same specific virus. The difference of the effect he explains by the application being made, in the first instance, to a secreting surface; and, in the second, to one that does not secrete; but, this belief in the identity of the infections, which produce these very different diseases, may now be said to be rapidly declining.

According to Mr. Hunter, the application of venereal matter commonly gives rise to inflammation, followed by a discharge from secreting surfaces, and by ulceration in other parts. It is acknowledged, however, that inflammation is not invariably produced by it.

Although the matter of *primary* venereal complaints, viz. of chancre, bubo, and according to Hunter, of gonorrhœa also, contains the venereal poison, and can communicate the disease to others, the matter of all *secondary* venereal complaints does not contain the specific virus, nor, of course, possess the property of being able to impart the distemper to others. Neither is the blood, nor any of the secretions of a venereal patient, possessed of such quality.

After the venereal virus has been conveyed into the circulation by the absorbents, Mr. Hunter inferred, that it did not long continue there, but was soon ejected, together with some of the excretions. Previous to its expulsion, however, it contaminates certain parts of the body, and gives them a *disposition* to the disease. Mr. Hunter's chief reason for supposing, that the virus does not remain long in the circulation, is, that when the parts, first affected with secondary symptoms, have been cured, before the disease is eradicated from such parts as are generally affected with secondary symptoms at a later period, the first parts which have been cured, never again become diseased *from the same stock of infection*, as, in all probability, they would do, if the virus continued mixed with the circulating fluids.

The reasons why the virus, after being absorbed, is sometimes expelled again, without leaving, in any parts whatsoever, a disposition to the disease, or in other words, any contamination, are not very well solved, by the Hunterian theories. Neither do they explain to us, why the number of parts, to

which the disposition is communicated, by the absorption of the virus into the system, should vary so considerably, as we find happens in different examples. Mr. Hunter, indeed, assigns to mercury the power of *preventing* the formation of the disposition; but, then, he represents the presence of the virus in the constitution as being so transient, and the disposition to the disease as being produced so nearly about the same time in whatever parts are contaminated, that, in a multitude of cases, the supposition, that mercury has been given to *prevent* the disposition in all or some parts, is altogether inconsistent with the foregoing principles.

But, though Mr. Hunter believed, that the *disposition* was formed nearly about the same time in such parts as happen to be contaminated; yet, his doctrines teach us, that they fall into a state of palpable disease, or (to use his own language) they afterwards take on the diseased *action* at different periods, some showing much sooner than others, the local effects of the disease. This remarkable circumstance in the history of syphilis, Mr. Hunter ascribes, partly to the different susceptibility of action in different organs, and partly to the effect of external circumstances, having no relation to the poison or the constitution.

Of these external circumstances, one of the principal is cold, which accelerates the local effects caused by the passage of the virus through the system. The change from *disposition* to *action* appears also to be hastened by proximity to the surface of the body, and by any great disturbance in the habit, from scrofula, gout, rheumatism, and, more especially, fever.

It was likewise one of Mr. Hunter's tenets, that the change from disposition to action, never happened while the constitution was under mercurial irritation.

He inculcates, that, when the disposition has taken place, the action may be suspended by mercury; but the disposition will remain, and the action show itself at some period after the mercurial irritation has ceased. But, although mercury cannot destroy a disposition already formed, it may hinder the disposition from being formed at all, or, in other words, prevent contamination. When the action has begun in one order of parts, it may be cured, and will not return in the part, or that order of parts, from the same stock of infection. But the diseased action may take place in another order of parts, if that other order has been contaminated; and, in this order, it must be treated as in the former. When the diseased action has taken place, and been cured in the part first affected, in

the throat and fauces, the skin and the bones, or periosteum, the patient may be regarded as free from the disease.

The usual time of the skin, or throat, taking on the diseased action, is, on a medium, six weeks after the subsidence of the mercurial irritation, by which the first symptoms were cured, and in the bones, about twice that time ; but, these intervals, between the primary and secondary symptoms, are subject to much variety.

Whatever doubtful appearances may arise in the skin, throat, or bones, during the mercurial irritation under which chancres or buboes are giving way, they are not regarded by Mr. Hunter as venereal ; and even if such secondary symptoms occur, after the mercurial irritation has ceased, but earlier than the usual periods above specified, they are not to be considered as unequivocally syphilitic. If no secondary symptoms appear in three months after the mercurial irritation has ceased, and the constitution has not, in the mean time, been occupied by any other disease, we have, for the most part, no reason to apprehend any complaints in the skin or throat from that stock of infection.*

That there are some glaring inconsistencies in Mr. Hunter's precepts, with regard to the venereal disease, I think no man of candour will deny. One of the most striking incongruities is the theory, that mercury cannot cure the disposition, and yet, by way of security, the recommendation of its continuance, for a certain time, after all palpable symptoms have been cured.

Throughout Mr. Hunter's writings, we are taught, that it is the invariable character of all really venereal complaints to become progressively worse, and never undergo any amendment, unless mercury, the specific remedy, be exhibited. Thus, chancres on the penis, and ulcers in the throat, are described as constantly growing worse, without the aid of mercury. In the third edition of this publication, which was printed in 1813, I expressed doubts concerning the veracity of this doctrine. I remarked, that, if a sore put on a healing appearance, without the aid of mercury, we were directed to infer, that the complaint was not venereal. I noticed the advice, which was formerly very common, in doubtful cases, to defer the employment of mercury, for the purpose of judging of the nature of the disease by the foregoing criterion. I then commented on the fact, that primary venereal symp-

* See Hunter's Treatise on the Venereal Disease, and Adams on Morbid Poisons, edit. 2. pp. 159, 160.

toms will *sometimes* yield to several medicines besides mercury. I called the reader's attention to the mass of evidence in favour of the nitrous and muriatic acids, the oxymuriate of potassa, &c. being in a certain degree anti-venereal. I did not assert, that these remedies could be depended upon as much as mercury ; but only that they possessed considerable power over syphilis, and would sometimes make chancres, venereal ulcers in the throat, &c. give way. By reference to the writings of Mr. Pearson, I showed his clear admission, that guaiacum and sarsaparilla were capable of alleviating symptoms derived from the venereal virus, though not of eradicating the disease.* Also his statement, that even bark would sometimes have a salutary effect on incipient buboes, ulcers of the tonsils, and gangrenous sores, from a venereal cause, was particularly remarked, as well as his description of the almost complete reduction of venereal buboes by this medicine.† I called the attention of the profession to Mr. Pearson's observation, that the carbonate of ammonia would sometimes relieve pains of the limbs, and *remove a venereal eruption*.‡ I adverted to his confession, that he had given the muriate of barytes, with great advantage, when he could not determine positively whether the case was venereal or not.§ I was struck with his remark, that elixir of vitriol would sometimes stop the progress of venereal ulcers, and make venereal eruptions fade and almost disappear, though he represented the benefit as not permanent. I pointed out his evidence, in confirmation of the fact, that the nitric and vitriolic acids had removed both the primary and secondary symptoms of syphilis ; and, in some instances, without the former having recurred, or the latter appeared at the usual time, when the cure was imperfect. The declaration of Mr. Pearson and several of his friends, however, that they had never seen a permanent cure accomplished by these acids, where secondary symptoms were present, was not omitted ; nor his own decided opinion, that the efficacy of such remedies in curing primary symptoms, was not sufficiently frequent to make them eligible medicines.||

I concluded, that if so many remedies are alleged to possess a certain anti-venereal quality, we must receive with doubt a doctrine, that all venereal affections constantly be-

* Observations on the Effects of various Articles in the Cure of Lues Venerea, edit. 2. pp. 12—25.

† Lib. cit. p. 61.

‡ P. 91.

§ P. 106.

|| Obs. on the Effects of various Articles in the Cure of Lues Venerea, edit. 2. pp. 236, 237.

come progressively worse, and never undergo the least amendment, nor put on a healing appearance, without the aid of mercury. I remarked, that if an incipient venereal bubo could sometimes be reduced by bark, as Mr. Pearson affirmed; or if guaiacum, sarsaparilla, mezereon, walnuts, and opium, had often removed some of the primary and secondary symptoms of lues venerea, as the same gentleman confessed; we were justified in suspecting, that *it is by no means the invariable character of syphilitic complaints to proceed, in every instance, from bad to worse, even though no medicines at all be exhibited.* I added, that whether this suspicion were correct or not, the inference to be drawn from Mr. Pearson's observations, at all events, appeared to be, that venereal sores, &c. would often become better, and even heal without mercury.

Since the period when the foregoing reflections were made, the great question, whether syphilis is curable without mercury, has been completely settled, chiefly by the meritorious labours of the surgeons of the British army.

The results of their experiments and inquiries furnish the most unequivocal proof, not only that syphilis may be cured without mercury, but even without the aid of any medicines whatsoever. As far as I can judge, no other inference ought ever to have been drawn, from all the evidence which may be brought to bear upon this point, from a review of circumstances connected with the history of the venereal disease; and this, whether we adopt the vulgar opinion, that true syphilis has only been known in Europe subsequently to the year 1493, or the belief, to which I am myself inclined, that it is a disorder which has prevailed from the earliest antiquity. In order to avoid, however, as much as possible, the latter controverted point, we shall confine ourselves to periods in which the existence of syphilis in Europe has been generally acknowledged.* A great many practitioners, both in the sixteenth and seventeenth centuries, combated the venereal disease with considerable success, without the aid of mercury. Fallopius, Palmarius, Abercromby,† and several

* There is so much difficulty in reconciling many of the phenomena and old theories respecting the venereal disease, that I am not at all surprised to find its very existence disputed in a modern anonymous publication; "*Sur la Non-existence de la Maladie Vénérienne.*" Paris, 1811.

† The work of this author, which was obligingly pointed out to me by Mr. Dunn, of Scarborough, is remarkable on account of its title: "*Tuta ac Efficax Luis Venerea saepe absque Mercurio, ac semper absque salivatione mercuriali Curanda Methodus.*" Authore Davide Abercromby, M. D. 12mo Londini, 1684

others, who might be cited, furnish proofs of the fact ; their principal remedies have been guaiacum, sarsaparilla, and antimonials, with occasional venesection, and purging.

Had it been the invariable character of the venereal disease to become regularly worse without mercury, no patients could ever have recovered, before the use of that mineral, in the treatment of the distemper, had been introduced into Europe ;* a supposition, contradicted by abundant evidence. Nor is it here necessary to avail ourselves of the arguments, which might be deduced from the cessation of the ravages of the particular distemper which broke out in the French army at the siege of Naples in 1494 ; because I do not see how we are authorized by the descriptions extant to regard that disorder in any other point of view, than as a contagious malignant fever, or pestilence, spreading with such celerity as to destroy a large army ; an event totally irreconcilable with the well-established facts, that true syphilitic complaints are for the most part chronic, the primary sores only communicable by contact, and the secondary not in any way infectious. Better evidence on the point before us seems to me to be furnished by a review of the practice of the old surgeons, to whom I have already adverted ; for, as they cured venereal complaints without mercury, at periods when syphilis unquestionably prevailed, it never can be argued, that *none* of their cases, so treated with success, could have been of that nature ; a conjecture, which, though it must naturally arise out of the Hunterian theories, appears, in the present state of our knowledge, to be erroneous.

An opinion is sometimes entertained, that the venereal disease is modified by climate, and that it can be cured in warm countries, by means which would completely fail in colder parts of the world. The facility of curing the venereal disease in the West Indies, the Brazils, &c. with sarsaparilla, guaiacum, and other vegetable productions, is a fact, which has long been familiarly known. Without the acknowledgment of such efficacy in these remedies, or in the powers of the constitution, the advocates for the American origin of syphilis, and the believers in the incurability of the disorder without mercury, would be totally unable to explain how it happened, that the population of the new continent was not annihilated by syphilitic ravages long before the visit of Co-

* In China, where the venereal disease is said to have existed 2000 years, mercury has been employed for its cure from time immemorial. See the reports of Tourneau, and other Jesuits, as detailed in Astruc's works.

lumbus. In Portugal, the use of mercury, in the treatment of the venereal disease, is nearly abandoned; the disorder proving there very mild, and being curable for the most part by mere topical treatment, or wearing itself out without the use of any adequate mercurial remedy. During a superintendence of the Portuguese hospitals for upwards of two years, Dr. Fergusson observed, that the common practice of the surgeons of that country was to cure all cases by simple topical applications; and the return of the patients to hospital with secondary symptoms, after being thus treated, was far from being an universal, or even a frequent occurrence.* It is curious to learn, however, with respect to the British soldiers in Portugal, that the disease in them was often peculiarly severe, a circumstance ascribed either to the difference of their constitutions from those of the natives, or to the treatment pursued by our surgeons being less beneficial, than what was adopted by the Portuguese. This striking diversity in the progress and consequences of the disorder cannot, I think, be rationally imputed to any modification of the virus itself by climate, but rather to a modification of the constitution by that cause, habits of life, &c.; because, if we adopt the first of these opinions, viz. that the thing is to be explained by a change of the virus itself, why should the disease, when contracted from the same sources of infection, have been followed only by mild effects in the Portuguese, and by a severe train of consequences in the British? But, should I be mistaken in supposing, that the constitutions of the natives rendered them less susceptible, than our troops were, of the ill-effects of the disease, then I see no other mode of accounting for the difference, than by concluding, that the simple treatment, followed in the Portuguese hospitals, was attended with more benefit, than the long and injudicious courses of mercury, which, in conformity to the then existing doctrines, were probably adopted in our own establishments, with little discrimination between real syphilis, and other resembling complaints, to which I shall presently advert.

Nor is it only in the warmer parts of Europe and America, that syphilis is readily subdued without mercury: the same truth is proclaimed in Asia, as may be learned by referring to Dr. Scott's observations on the anti-venereal virtues of the nitro-muriatic acid,† and of baths impregnated with it. To me this gentleman's statements appear more important in re-

* See Med. Chir. Trans. vol. iv.

† Ibid. vol. viii. p. 173, &c.

lation to the point before us, than as connected with the question of the real efficacy of the particular mode of treatment, which it is the object of his essay to recommend; because, as syphilitic diseases are now known to be capable of a spontaneous cure, it becomes doubtful, what share of benefit ought to be ascribed to the acid, especially to its external use in the form of baths.

The curability of every kind of ulcer, by common means, is well known at Paris, where Cullerier annually demonstrates this fact to his pupils; but, after the ulcers are healed, each patient is put upon a mercurial course, in order to prevent secondary symptoms.* Several of the German surgeons, who were in our service during the late war, were always extremely reluctant to prescribe mercury for the cure both of syphilis and resembling complaints; and yet the success obtained in their hospitals without mercury, was at least equal to what resulted from the opposite treatment in those of other corps.†

But no facts have had greater weight, than those of Mr. Rose,‡ in regulating the judgment of modern surgeons, on the question of the curability of syphilis without mercury. The importance of this question (says he) is obvious, not so much in reference to the treatment of syphilis under common circumstances; for, the strikingly good effects of mercury will probably not render it advisable in general to give up the use of that remedy, but from the change which it will produce in our views of the diagnosis of that disease. The distinction, which has engaged such a share of attention of late years, and which is evidently so important, between syphilis and syphilitic diseases, has been made to depend so much upon the former admitting of no cure, except by mercury, that, if this principle should be found to be erroneous, the difficulties which have attended it, will, in a great measure, be explained. Mr. Rose then adverts to the occasional trials which have been made of sarsaparilla, carbonate of ammonia, opium, and different acids, in the treatment of the venereal disease, and

* Guthrie in *Med. Chir. Trans.* vol. viii. p. 552.

† This seems at first contradictory to the general admission, that mercury, though not absolutely necessary, often expedites the cure of true syphilitic diseases. In order to reconcile these statements, we should recollect, that mercury frequently retards the cure of other complaints, not truly syphilitic, which are more frequent than the former, in a proportion beyond computation.

‡ See *Observations on the Treatment of Syphilis, with an Account of several Cases of that Disease, in which a Cure was effected without the use of Mercury*: in *Med. Chir. Trans.* vol. viii. p. 349, &c.

to the success of some of these remedies, as attested by men of veracity and ample experience. He notices the fact, of mercury either not being used at all in several parts of Europe, or being used in a manner which we should consider totally inadequate to the cure of the disease. He allows, that many of the cases which happened in Portugal, as mentioned by Dr. Fergusson, would not be regarded by cautious practitioners as truly syphilitic, because, in describing the effects of the disease on the British soldiers, this gentleman states, that, *while the constitution was strongly under the influence of mercury*, the patients became affected with secondary symptoms, in a proportion that could not have been expected. Mr. Rose then speaks of the conclusion, drawn by Mr. Carmichael from Dr. Fergusson's description, viz. that the disease, which prevailed in Portugal, was a phagedenic, or sloughing ulcer, different from the true syphilitic chancre, and for which mercury is neither necessary nor serviceable; an inference he considers refuted by the impossibility of supposing, that a country, then overrun by every description of foreigners, could escape the introduction of syphilis. He had tried the non-mercurial treatment in the hospital of the Coldstream Regiment of Guards, for a year and three-quarters, and *had certainly succeeded, without mercury, in curing all the ulcers on the parts of generation, which he had met with in that period, with the constitutional symptoms to which they gave rise.* Though some of these cases might not have been truly syphilitic, it is impossible to suppose that others were not so. A considerable number of them presented the commonly received characters of a primary venereal sore, as loss of substance, indisposition to granulate, and an indurated margin and base. They were also seen and considered as well-marked cases of true chancre by Mr. Brodie, Mr. Baccot, Mr. Worrell, &c. The battalion of the Coldstream, in which they occurred, consisted of upwards of a thousand men, who, being stationed in this metropolis, and often associating with the lower orders of prostitutes, were particularly exposed to the risk of infection, and might have been expected, in a much shorter period, to furnish many examples of the venereal disease.

In the treatment, all ideas of specific remedies were entirely laid aside. The patients were usually confined to their beds, and such local applications employed, as the appearances of the sores seemed to indicate. Aperient medicines, antimony, bark, sulphuric acid, and occasionally sarsaparilla, were administered. The observations of Mr. Guthrie, Professor Thomson, Dr. Hennen, and indeed the united reports of all

our army surgeons, from different parts of these kingdoms, and France, also fully proved the curability of the primary and secondary effects of syphilis without mercury, and, generally speaking, of all sores, whether truly syphilitic, or only of a resembling nature, "provided sufficient time be granted, the constitution be good, the patient regular in his mode of living, and attention be paid to cleanliness and simple dressings, and to keep the patient in a state of quietude."*†

From the preceding facts and view of the subject, many curious and important considerations naturally arise. In the first place, they oblige us to renounce all the most important doctrines advanced by Mr. Hunter, and adopted in almost every school, in relation to the history, progress, and cure of the venereal disease. They compel us to believe, either that true syphilis has totally changed, in the course of the last twenty or thirty years, or that most of the Hunterian theories about it were always false, and founded upon mistaken notions. At the present day, it will be extremely difficult to come to a positive decision, with regard either to the altered nature, or diminished frequency of syphilis; more especially, when we recollect two facts; first, that ever since the epoch of the supposed introduction of this disease from America, there have always been practitioners, who successfully treated every form of venereal complaints without mercury; and secondly, the absolute impossibility of our asserting, that if experiments had been formerly made, similar to those which have now been undertaken on a public-spirited, impartial, and extensive scale, the same results and inferences would not have followed. The facts, recently established, lead also to other highly interesting questions, concerning the frequency and nature of the secondary symptoms, which occur when no mercury has been employed.

Upon an average, according to Mr. Rose, one out of every three of the sores, thus treated, was followed by some form or other of constitutional affection, which was in most instances mild, and sometimes so slight, that it would have escaped notice, if it had not been carefully sought for. The constitutional symptoms were evidently not such as could be

* Guthrie, *Med. Chir. Trans.* vol. viii. p. 556.

† {H. M. J. Descucilles, in the Memoir on the Treatment of Venereal Disease without Mercury, gives his experience in the treatment of 1312 cases. Mean duration of treatment was thirty-two days. Dr. J. Harris, of this city, has treated 164 with similar successful results. See Memoir, &c. published by Carey and Lea; edited by J. Hays; for 1830.}

regarded as venereal, if we give credit to the commonly received ideas on the subject. Caries of the bones, and some of the least equivocal symptoms, did not occur. In no instance was there that uniform progress, with unrelenting fury, from one order of symptoms and parts affected to another, which used to be considered as an essential characteristic of true syphilis.*

Great diversity, however, prevails in the statements, relative to the frequency of secondary symptoms where no mercury has been used. While Mr. Rose represents the proportion, observed by himself, to be as great as one out of every three cases, only six cases of secondary symptoms were remarked in the York Hospital, in nearly 100 patients, who had been treated without mercury. It is allowed, however, that the real proportion might have been somewhat larger; and, according to some other returns, collected by Mr. Guthrie, the proportion would appear to be about one-tenth.† It is mentioned by Dr. Hennen, that eruptions were much more common in patients treated without mercury, than in others treated with it; but the breakings out did not end in ulcerations, as they frequently did when that mineral had been used.‡ The observations, drawn from the returns of certain military hospitals, and published by Mr. Guthrie, also tend to prove, that mercury lessens the frequency of secondary symptoms; for it appears, that out of 521 cases, treated with mercury in one district, only ten cases of secondary symptoms happened.§

As to the general mildness and curability, without mercury, of these secondary symptoms, which takes place in cases where that mineral has not been employed, the reports of nearly all the gentlemen, who have entered into this investigation, completely agree. They also concur about the rarity of an affection of the bones.

The further the subject before us is investigated, the more reason we find to join Hunter, Carmichael,|| and others, in the belief, that what has been generally considered as syphilis, is not one disease, but several, and that "*other diseases* may

* See Med. Chir. Trans. vol. viii. p. 422.

† Ibid. pp. 559—561.

‡ Edinb. Med. and Surg. Journ. No. 54. p. 202.

§ Op. et. vol. citat. p. 569.

|| See his inquiry into the probability of the spontaneous origin of some diseases, which bear a resemblance to the constitutional symptoms of Syphilis, in his "Essay on the Venereal Diseases, which have been confounded with Syphilis." 4to. Lond. 1814.

not only resemble the venereal in appearance, but in the mode of contamination; proving themselves to be poisonous, by affecting the parts of contact; and from thence producing, not only immediate consequences similar to buboes, but remote consequences, similar to the lues venerea."

If any gentleman is entitled to superior praise for industry and talent in the investigation of the distinctions, between syphilis and the diseases generally confounded with it, this high compliment, I think, is unquestionably due to Mr. Carmichael. He confines the term syphilis to that disease, in which the chancre, or primary ulcer on the genitals, has a *hardened edge and base*; in which the blotches are *scaly*, as described by Willan, with the *excavated ulcer of the tonsils*, noticed by Hunter; or when affections of the bones are complained of, those patients alone are truly syphilitic, who have *nocturnal pains in the shafts of the long bones*, or *decided nodes*, or *enlargement of the bone*. All other cases, though many of their characters may resemble those of syphilis, are not to be considered as syphilitic; but as they proceed from sexual intercourse, he adopts the term venereal for them.* In considering the primary and secondary symptoms of the disease, I shall notice some of the principal opinions advanced by Mr. Carmichael, to which the greatest attention is certainly due. One of the most important propositions, to which his observations lead, is, "the constant association of a distinct and peculiar train of constitutional ailments, with corresponding primary symptoms, demonstrating that the regularity, which marks the character of all morbid poisons, also has a place in venereal diseases."

OF TRUE CHANCRES, AND OTHER PRIMARY SORES.

Chancres signify sores which result from the application of true syphilitic matter to a part of the body; and, consequently, they are generally situated on the genitals. A true chancre, according to Mr. Hunter, is somewhat of a circular form, excavated, without granulations, with matter adhering to the surface, and with a thickened edge and base. This hardness, or thickening, is very circumscribed; not diffusing itself gradually and imperceptibly into the surrounding parts, but terminating rather abruptly. When the disease occurs on the prepuce, or frænum, the effects of the inflammation are more

* See an Essay on the Venereal Diseases, which have been confounded with Syphilis. 4to. Lond. 1814.

extensive. When the sore is on the glans penis, it sometimes causes profuse bleeding. In women, chancres are usually situated on the labia, or nymphæ, and, very rarely, in the vagina. The discharge from a chancre contains the true syphilitic poison, and, of course, is capable of imparting the disease by contact or inoculation.

Mr. Carmichael also adopts Mr. Hunter's definition of chancre, and points out, that it is the solidity, firmness, and abrupt termination of the surrounding induration, which chiefly distinguish it from other ulcers. The induration, he says, is less marked, when a chancre is situated on the body of the penis, but then the sore is of a dark livid colour, which, if mercury be not resorted to, "is alternated every third or fourth day, with that of a light brown, or tawny, sufficiently distinguishing it from the dark sloughing ulcer, with which it might be confounded." The chancreous ulcer, at the same time, extends its dimensions slowly, and, "as it advances, the surrounding induration obviously increases." Phymosis and inflammation are also "less frequently attendants upon canchre, than upon those ulcers which are destitute of its characteristic marks." The secondary symptoms, represented by Mr. Carmichael, as following the absorption of the virus of a true syphilitic chancre, or bubo, are, first, an eruption of scaly blotches, presenting either the character of lepra, or psoriasis, unattended with any obvious degree of fever; secondly, excavated ulcers of the tonsils; thirdly, pains in the joints, tibiæ, cranium, &c.; fourthly, nodes. He proposes also for venereal diseases, a new nomenclature, founded on the characters of the eruptions, which he thinks afford the most certain criterion, and he names the true chancre and its consequences the *scaly venereal disease*.*

Mr. Carmichael divides the primary diseases which have been confounded with syphilis, into two classes; the first comprehends, 1. A superficial ulcer, without induration, but with elevated edges. 2. A similar ulcer, destitute not only of induration, but of elevated edges. 3. An excoriation of the glans penis, and internal surface of the prepuce. 4. Gonorrhœa virulenta. From the first of these four diseases, he has been seldom able to trace any constitutional symptoms. The constitutional symptoms of the other three he describes as precisely alike.

* See Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, p. 202, &c. 8vo. Dublin, 1818. Also, Essay on Venereal Diseases, edit. 2. p. 304, &c. 8vo. Lond. 1825.

In the second class, Mr. Carmichael comprises the two remaining species of pseudo-syphilitic disorders, viz. the phagedenic ulcer, and the sloughing ulcer. In the year 1814, he calculated, that the number of patients with these ulcers, who sought admission into the hospital under his charge, exceeded those with true syphilitic chancre, in the proportion of five to one. What the proportion may be at the present time, I know not; but it must be wonderfully changed, if the very curious assertion, subsequently made by this author, be correct, viz. that, in the considerable space of time which had elapsed since he published his first essay, *he had met with only three cases of true syphilitic chancre in all his extensive practice, public and private.** How we are to reconcile this account with Dr. Hennen's statement, that, on an average, twenty out of every 105 are Hunterian chancres, is difficult to say, unless we suppose the latter gentleman is more easy in admitting cases as chancres than Mr. Carmichael, who rejects all ulcers from this class, which do not possess "the callous edge and base, terminating abruptly under the skin, and feeling nearly as hard as a piece of cartilage."

Let us now consider more particularly the primary diseases, which Mr. Carmichael has described as being liable to be confounded with syphilis, excluding from present attention, however, the subject of gonorrhœa. The first class of these diseases are:—

1. *The superficial ulcer, without induration, but with elevated edges*, presents a reddish brown surface. It is not excavated, but is either on a level with the surrounding skin, or considerably raised above it, though sometimes the elevated edges give an appearance of excavation. At its commencement, it appears in the form of a small pustule, attended with itching. It sometimes bears a strong resemblance to the phagedenic ulcer, from which, however, it may be distinguished by its raised and well-defined margin, the absence of the irregular and corroded surface, and of the pain of that ulcer. It may be known from a chancre, by having no callous edge and base. It occurs on the external surface of the prepuce, body of the penis, and scrotum; and sometimes a circle of small ulcers of this kind, forms upon the orifice of the prepuce, producing an obstinate phymosis, which remains after the sores are healed, and requires the use of the knife. Mr. Carmichael has seldom traced this sore to its constitutional

* Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, p. 14.

symptoms, but, in the appendix to his essay, he details two cases, in both of which the eruption was *pustular*, and afterwards spread into ulcers, covered at first with *thin* crusts. In short, the ulcer with elevated edges, without induration, according to Mr. Carmichael, is liable to be followed by buboes with undermined edges; an eruption of pustules, generally phlyzaceous, preceded by fever, and terminating in ulcers covered with thin crusts, healing from their margins, and, when the disease is on the wane, the eruption desquamates into scaly red blotches. On the fauces, ulcers occur in different places, with a white aphthous appearance; and sometimes pains in the joints and nodes. To this ulcer, and its consequences, Mr. Carmichael applies the name of *Pustular Venereal Disease*, from the character of the eruption.*

2. *The simple ulcer, without induration, elevated edges, or phagedæna*, has neither the indurated base, which attends the true syphilitic chancre, nor the elevated edges which surround the primary ulcer of the pustular venereal disease; nor the surface of the primary phagedenic ulcer. It begins on the prepuce, or body of the penis, as a small pustule; then forms a thin crust, which soon falls off, leaving an excavated, round, or oval sore. In the second week, this fills up, and afterwards rises above the skin, presenting a smooth surface, of a healthy colour, but without granulations, and with somewhat of a fungous appearance. It most frequently occurs on the glans and internal surface of the prepuce, when it generally excites phymosis; but is sometimes on the outside of the prepuce, on the body of the penis, or on the scrotum; and, in women, it takes place on the labia, perineum, and fossa of the nates.

3. *Excoriation of the glans penis, and internal surface of the prepuce, attended with purulent discharge*, is usually accompanied with gonorrhœa, and produces phymosis. The corona glandis is the part most affected; but, when the prepuce can be retracted, the excoriation is found to be in patches only, with intervening spots of sound cuticle.

Mr. Carmichael's observations lead him to believe, that the constitutional symptoms, which are apt to follow the small ulcer without induration, or elevated edges, and the patches, excoriation of the glans and prepuce, and, even in some rare examples gonorrhœa virulenta, are the same, and therefore, that all these diseases have their source in the same

*Op. cit.&c., p. 62; Lond. Med. Journ. for 1815; and Essay on Ven. Diseases, edit. 2. p. 148. 8vo. Lond. 1825.

venereal poison. The constitutional symptoms consist of more or less fever, which ushers in a *papular* eruption, and soreness of the fauces, attended with difficulty of swallowing, severe pains in the head and larger joints, iritis, and sometimes inflammatory swellings over the superficial bones, which many would call nodes.* The whole of these cases, taken collectively, he names the *Papular Venereal Disease*.†

The second class of primary diseases, which have been confounded with syphilis, consists of two species; viz. the *phagedenic ulcer*, and the *sloughing ulcer*.

1. *The phagedenic ulcer* is described by Mr. Carmichael, as a corroding sore, without granulations, or surrounding induration, spreading with great rapidity, and having its destructive process increased, instead of being checked, like chancre, by mercury. It more frequently attacks the glans, which it sometimes totally destroys, and occasionally, notwithstanding "every anodyne and lenient application, the ulceration will gradually proceed, until the entire penis is destroyed." The ulceration, by destroying the coats of an artery, may produce such profuse hemorrhages as can only be stopped by ligatures, but, in this case, its progress is arrested. One of its remarkable characteristics is the frequent return of ulceration, after the part has healed, to the very same spot which was first affected. The constitutional symptoms are, an eruption of tubercles, or spots of a *pustular* tendency, or both intermixed, preceded by fever, and terminating in ulcers covered with thick crusts, which often assume a conical form, healing from their centre, and extending with a phagedenic margin.‡ The affection of the throat is "a white slimy-looking ulceration, which occupies almost the whole of the back of the pharynx in view; and may be followed by caries, exfoliation of the spongy bones, tenderness of the ossa nasi, and a foul discharge from the nostrils. The velum and uvula are occasionally destroyed, so that on looking into the mouth of a person in this lamentable state, there appears one vast continuous ulcerated cavity, covered with white viscid matter, and extending from the palate to the lower part of the pharynx. At the same time that the patient is thus affected, the larger joints, and sometimes the smaller, also become red, swelled,

* Essay, &c. p. 82. See his Obs. on the Symptoms and Specific Distinctions of Ven. Diseases, p. 205., and his Essay, &c. edit. 2. 1825.

† Carmichael's Obs. on the Symptoms and Specific Distinctions of Ven. Diseases, p. 209.

‡ Ibid.

and exquisitely painful, and nodes suddenly appear, which cannot be distinguished by their aspect from those of syphilis. According to Mr. Carmichael, the ulcer with elevated edges not unfrequently exhibits the apparently corroded surface, which characterizes the phagedenic ulcer, and its secondary symptoms also have a very close resemblance to those of the latter sore.*

2. *The sloughing ulcer* at first resembles a small black spot, which produces so little uneasiness, that it remains unnoticed for several days; it soon, however, increases, and, when the slough separates, the sore is not clean and granulating, as after simple mortification, but a corroding phagedenic ulcer appears, which becomes painful, assumes a bluish cast, and is soon covered again with a fresh slough. It proceeds in this manner, alternately sloughing and ulcerating, until the whole of the external organs of generation, and sometimes the bladder also, are involved, and, even if the progress of the disease be checked, the orifice of the urethra is so contracted, that great difficulty in voiding the urine is experienced. The sloughing ulcer is said to produce the same kind of secondary symptoms as are connected with the phagedenic sore, and the whole of these affections Mr. Carmichael distinguishes by the name of the *Phagedenic Venereal Disease*.

Such is the arrangement proposed by Mr. Carmichael, in which, however, many surgeons do not coincide; I mean with respect to the regularity and peculiarities of the secondary symptoms, and of the eruption in particular, represented by that gentleman as appertaining to each primary disease.† Indeed, he carries this doctrine so far as to say, that, with the exception of some anomalous cases presently to be noticed, every primary affection has its corresponding eruption, so that we may foretell by the former what the latter will be; or, if we have only the opportunity of seeing the eruption, we may judge what the primary ulcer has been. That many difficulties still oppose the complete reception of these doctrines, is a truth, which candour obliges me to state. Various observations, published by Dr. Hennen and others, prove, that primary sores, of a determinate character, frequently communi-

* Op. cit. p. 59.

† “As we have seen true syphilis accompanied by eruptions not scaly, so we have seen the primary symptoms of pseudo-syphilis described in the first class of our author’s arrangement, followed both by pustular and tubercular eruptions; and that the same infection will also produce eruptions of a different character in different individuals, has been ascertained,” &c. See Lond. Med. Repository, vol. iv. p. 323.

cate ulcers of a very different description, and sometimes more than one kind of sore, to the same infected person. Certain cases, detailed by Mr. Evans, show, that various sores may be the result of a connexion with common prostitutes, in whom no complaint at all can be detected; such ulcers probably arising from the mere irritation of the natural secretions of the parts. There must, also, be some hesitation in the adoption of the sentiment respecting a particular virus having the power of producing a primary phagedenic sore, because this character of an ulcer rarely exists from the commencement, and when it occurs, may frequently be referred to disordered health, bad treatment, neglect, and other circumstances. Also, since a phagedenic sore is generally attended with great pain, its frequency is much greater, than could be accounted for by the supposition of patients in this state being likely to have connexion with women. Mr. Carmichael, however, with his usual candour and devotion to truth, wishes his facts to be considered independently of all theory about the plurality of poisons; and, certainly, the *frequent* association of particular primary complaints with secondary ones of determinate characters, is a point first established by him, and promising a great deal of additional light to this obscure subject.

With respect to the *treatment of the true syphilitic chancre*, the fact of even this kind of sore being generally capable of cure without mercury, though often in a less expeditious manner, must be admitted, the proofs of it being most unequivocal. The determination of this point, however, is far from amounting to any thing like a decision, that mercury ought not to be employed in the cure. On the contrary, all those gentlemen who have so ably investigated the point, candidly own, that mercury generally expedites the recovery. Thus, Mr. Guthrie tells us, that ulcers, possessing the true characters of chancre, required in general a longer period than other sores for their cure, "that is, from six, eight, to ten, twenty, and even in one case, twenty-six weeks, healing up and ulcerating again on a hardened base;" and he afterwards expresses his conviction, that almost all these protracted cases would have been cured in one-half, or even one-third, of the time, if a moderate course of mercury had been resorted to, when common applications were found to fail.* If some other statements laid before the public by another gentleman were correct, however, the effect of mercury in accelerating the cure of chancres would be less striking; because it is said,

* Med. Chir. Trans. vol. viii. pp. 556, 559.

“the general period (required for the healing) was four weeks, and this whether the sores possessed the Hunterian characteristics or not.”* It is admitted, however, by the same author, that the cure of some other protracted cases would probably have been hastened by the use of mercury. The fact of the possibility of curing true chancres without mercury, is then, by no means, to be confounded with the question of the propriety of the practice. It is of vast importance, however, as it demonstrates the error of inferring, that a sore cannot be venereal because it is healed without mercury, and exposes the equally false and still more dangerous notion, that large quantities of this mineral are necessary for the cure of a chancre. It teaches us, that, in unfavourable states of the health, we may await its improvement with safety, before we have recourse to the medicine. In short, it instructs us, that mercury, though useful, is not so absolutely necessary in the treatment, as to claim the name of a specific for any primary syphilitic ulcers. Hence it ought to be prescribed in moderation, and rather in alterative doses, than in such quantities as are calculated to excite profuse salivation.

Whether the united experience of surgeons in general ultimately confirm, or not, Mr. Carmichael's belief in the existence of different venereal poisons, and in the uniformity of the secondary symptoms arising from each of them, still, I think, one truth will remain unshaken; viz. that true syphilitic chancres are often influenced in their progress by constitutional causes. In irritable weak habits, even after the original character and appearance of the sores have been changed by mercury, we often find, that the ulceration will continue to spread, or sloughs to be formed. Too often, under such circumstances, the foul appearance of the ulcerated surface leads the unwary practitioner to increase the quantity of mercury; the system then becomes more and more disordered and debilitated; and the local disease grows worse with the declension of the health, until either the patient dies, or is absolutely too weak to employ the destructive medicine any longer.

To the foregoing statement, Mr. Carmichael himself also assents; admitting, that neglect, local irritation, and excessive constitutional irritability, will cause a venereal ulcer, as they will any other, to become phagedenic, however mild originally in its nature. It must, therefore, he observes, be in the highest degree useful to attend to the progress of an

* Hennen, in *Edinb. Med. and Surg. Journ.* No. 54. p. 207.

ulcer, and if possible ascertain, *whether it was of the phagedenic species from its commencement*, or not ; and, if not, it is not to be classed with that venereal disease, which may be termed phagedenic.*

Whenever chancres, which originally presented the true syphilitic character, afterwards alter, and rapidly extend themselves by a phagedenic, or sloughing process, there is always great reason to believe, that the alteration is owing to an unfavourable state of the constitution, irritation of the diseased part, or general bad treatment. In such cases, mercury should be omitted, without delay ; bark, sarsaparilla, guaiacum, and the nitrous or sulphuric acid prescribed, with absolute rest, plenty of good fresh air, &c. As far as my observations extend, one of the best dressings in these cases is a solution of the extract of opium, in the proportion of ʒiiss to ℥ij of water, which may be applied by means of lint, laid under a simple pledget. Thus the state of the constitution will be amended ; and, as this happens, the morbid appearances of the sore, which depended on general weakness and irritability, will disappear ; and then, if necessary, (which I believe will rarely be the case,) mercury may be given in moderate quantity again.

As every surgeon knows, a true syphilitic chancre, while small, may be cured by removal with the knife, or destruction with caustic, and, if none of the virus has been absorbed, the patient will remain free from secondary symptoms. As, however, there is always an uncertainty, whether absorption has taken place or not, the plan has never been very commonly adopted, because if mercury is to be given at all events, with the view of preventing secondary symptoms, no good is gained, as the sore will heal very well without it. Astringent lotions, containing the sulphate of copper, or that of zinc, and any common simple ointment, are the best general applications for chancres. The dressings must vary, however, according to the state of the sore ; and, in the healing stage, when the granulations are high, the use of the nitrate of silver, or of the unguentum resinæ with ʒj of the pulv. hydrargyri nitrico-oxydi to each ounce of it, will materially expedite cicatrization.

With regard to the treatment of primary complaints, liable

* Obs. on the Symptoms, &c. of Ven. Diseases, &c. p. 61. The existence of a primary phagedenic ulcer, originating from a specific poison, independent of constitutional causes, is not universally admitted.

to be confounded with true chancre, my limits oblige me to be very brief.

The superficial ulcer, without induration, but with elevated edges, may be cured by dressing it with washes, either of oxymuriate of mercury and lime-water, in the proportion of a grain to an ounce; or of the submuriate and lime-water, in the proportion of ten grains to an ounce; or of the compound spirit of lavender alone, or diluted with one or two parts of water. Together with these applications, Mr. Carmichael orders decoctions of sarsaparilla, and small doses of antimony, either separately, or in conjunction. "Primary ulcers, with elevated edges, (says he), are often extremely obstinate under the use of mercury. I have frequently seen that medicine exhibited in full doses, which maintained a strong mercurial action in the system for several months, without inducing them to heal." He assures us, also, that stimulating and caustic applications do no good, and if the ulcer be irritable, make it extend. "In fact, our principal care should be to keep the patient at perfect rest; and this observance, with gentle astringent applications, or mild ointments, seems to be all that is requisite," the above medicines being prescribed rather to satisfy the patient, than as essential.*

The simple primary ulcer, without either induration or elevated edges, requires the same treatment as the former case, except when it appears on the external surface of the prepuce, body of the penis, or on the scrotum, resembling a fungus, or soft wart; in which case, the wash should consist of two or three grains of the oxymuriate of mercury to an ounce of water.

The third example "*excoriation of glans penis, and internal surface of the prepuce, attended with purulent discharge,*" may also be cured by simple means, resembling those recommended for the two preceding cases. As, however, it is often joined with gonorrhœa and phymosis, the chapters on those subjects may be consulted.

Mr. Carmichael is strongly adverse to the plan of giving mercury in cases of phagedenic chancres, which he represents as being invariably rendered worse and more intractable by that mineral. With respect both to this and the *sloughing sore*, "the treatment which succeeded best, was the use of means calculated to lessen inflammation and pain, including general blood-letting, antimonials, purgatives, cicuta, and

* See Obs. on the Symptoms and Specific Distinctions of Ven. Diseases, p. 47.

opium. The local applications were warm fomentations, and bread poultices, frequently with the addition of opium. In every instance, low diet, and the recumbent position, were strictly enjoined." Mr. Carmichael also found nothing more effectual in stopping the progress of these destructive ulcers, than "the division of any band of integument, which connected two portions of the ulcer together," such division being merely an anticipation of the destruction of this bridle by ulceration. He also commends the removal of any jagged part of the edges of the ulcer, or of the adjoining surface, which may have a livid colour, and be ready to fall into ulceration; measures, which he thinks owe their utility chiefly to the bleeding excited by the use of the knife.*

OF SYPHILITIC AND OTHER BUBOES.

While no venereal matter has been taken up from the surface of a chancre by the absorbent vessels, the disease is entirely local. The matter, in its passage through the inguinal glands, frequently occasions an inflammation and enlargement of them, followed by suppuration and ulceration. The secondary affection is named a venereal bubo. The syphilitic poison (it is also not unfrequently supposed) may sometimes lodge on the sound skin, be absorbed without the occurrence of any ulceration at all, and a bubo be the consequence. However, true syphilitic buboes are commonly preceded by a chancre; and it is a remark made by Mr. Hunter, that they more frequently follow sores on the prepuce, than those on the glands.

The absorbent glands in the groin are subject to enlargements, which are altogether unconnected with venereal causes, and require to be discriminated from true venereal buboes. Mr. Hunter was of opinion, that commonly only one gland is affected by the absorption of true syphilitic matter; and, if this be the case, we have one criterion, by which a true venereal bubo may be known from other swellings. The syphilitic poison also affects the glands nearest the seat of absorption, and never those, which are situated in the course of the iliac vessels, and higher up.

The syphilitic bubo commonly begins with a sense of pain, soon followed by a small hard tumor, which increases, like every other inflammation that has a tendency to suppurate. If not checked, it advances to suppuration and ulceration, the progress of the matter to the skin being quick.

* Op. cit. pp. 64, 65.

Some few syphilitic buboes, however, are slow in their progress, and Mr. Hunter suspected, that the inflammatory process is then retarded by mercury, or a scrofulous tendency.

According to Mr. Carmichael, the distinguishing characteristics of a syphilitic bubo, are more difficult to assign, than those of chancre; but, he conceives, that the aching pains, which attend it, the callous feel of its bottom, and its dark, foul, tawny appearance, may assist in forming a diagnosis. I perfectly agree with this valuable writer, respecting the propriety of not ordering mercury for buboes which have been preceded by chancres.

Buboes, not of a syphilitic nature, are generally preceded, and attended with a slight fever, or, as Mr. Hunter says, the common symptoms of a cold, and the swellings are usually indolent and slow in their progress; but when quicker than common, they are more diffused than syphilitic buboes, and often affect at once several glands. In general, they do not suppurate, but continue stationary; and, when they do suppurate, it is slowly, and often in more glands than one. The matter comes slowly to the skin, unattended with much pain, and the integuments are of a dark purple colour. If the swelling be only in one gland, be very slow in its progress, and give but little or no pain, it is probably scrofulous.

The same observations which have been delivered respecting the falsity of the doctrine, that true syphilitic chancres do not admit of cure without mercury, are equally applicable to the buboes, which originate from such primary sores. Thus, in a great many of the cases, which were treated in the hospitals of the Guards without mercury, the absorbent glands of the groin were affected, and often suppurated. "The abscesses were in general allowed to burst of themselves, and almost all of them healed readily." Two cases, however, are mentioned, which proved more troublesome; one was that of a sloughing or phagedenic bubo; the other an instance in which the difficulty arose from the number of absorbent glands which became affected.* In numerous other cases of primary sores, treated without mercury, as referred to by another late writer, we are informed, not only that buboes occurred on the average with less frequency, than in other instances, where mercury had been used, but also, that these swellings were not so often followed by suppuration; a circumstance ascrib-

* Rose, in *Med. Chir. Trans.* vol. viii. p. 379. Guthrie, *Op. et vol. clt.* p. 558.

ed to the antiphlogistic means which were employed. Mr. Hunter, who had the same implicit faith in the necessity of mercury in the cure of syphilitic buboes, which influenced all his opinions relative to the true venereal disease, conceived, that in attempting to effect the dispersion of a syphilitic bubo, it was an object of high importance always to make as much mercury as possible pass through the swelling, by rubbing the urgent. hydrarg. on surfaces, from which the absorbents tended to the seat of the local disease. The same plan he deemed equally commendable when a bubo of this nature was in a suppurated state; for, both in this and the preceding stage of the swelling, the medicine, says he, thus applied, cannot pass into the common circulation without going through the diseased parts, whose cure it must promote in its passage through them, while it also prevents the matter, which has already passed, and is still continuing to pass, into the constitution, from acting there, so that the bubo is cured, and the constitution preserved.

According to the Hunterian precepts, then, the thigh, leg, or part of the abdomen on the same side as the bubo, are the places on which the frictions should be made. Mercury, however, was never intended to do more, than cure the specific quality of the inflammation. When the common inflammation rises very high, bleeding, purging, and fomentations, are requisite auxiliary means; and if the bubo be conjoined with erysipelatous inflammation, Mr. Hunter recommended bark; if with serofulous, hemlock, and poultices made with sea-water. True syphilitic buboes ought seldom to be opened. When it is thought proper to open them, the skin should be allowed to become as thin as possible; for the abscess will heal better in consequence of this rule being observed. How long the mercurial frictions are to be continued, and in what quantity the ointment is to be rubbed in, are questions to which different replies would be made by the believers in the Hunterian tenets, and by what may be called the mercurial reformers, who, while they generally inculcate the possibility of curing all forms of syphilis without mercury, acknowledge the superior efficacy of this mineral in accelerating the cure of some of them, and rendering secondary symptoms less frequent, which advantages they think may also be best obtained by prescribing mercury in small alterative quantities. While surgeons were swayed by the belief, that no syphilitic disease could be cured without mercury, the common plan, when a bubo healed very slowly, was to discontinue this mineral after the constitution had been kept a certain time (perhaps five or six weeks) strongly under its influence. But when the bubo

had rapidly healed, mercury was given for a fortnight or three weeks afterwards. It was universally admitted, however, that there were many instances, in which it was quite unnecessary to continue mercury until a bubo had entirely healed.

Sometimes the sores produced by buboes assume an ill-conditioned appearance, even when they are losing, or are quite deprived of their original syphilitic character. We are not, therefore, always to set down the backwardness of a bubo to heal, as a mark of the presence, or continuance of its first nature. The disorder, produced in the system by a course of mercury, is frequently the cause of syphilitic buboes being gradually converted into phagedenic ulcers, or such as will not cicatrize. In scrofulous constitutions, the irritation of venereal matter, in its passage through an absorbent gland, frequently gives rise to a scrofulous enlargement of the groin, and this disease cannot be made to heal by the influence of mercury; on the contrary, if the system should have already suffered much from a mercurial course, perseverance in this treatment will change the usual indolence of a scrofulous abscess, or ulcer, into a foul, fast-spreading, ill-conditioned, local disease. In these cases, bark, sea-bathing, pure air, and the internal and external use of hemlock, are serviceable.

With regard to such buboes as belong to what Mr. Carmichael terms the *papular venereal disease*, and arise from primary ulcers, which he distinguishes by the negative characters of having neither callosity, raised edges, nor phagedenic surface, his experience has not taught him, that mercurial frictions will discuss these swellings. On the contrary, the trials, which he has made of this medicine, incline him to believe, that it tends to increase the inflammation and chance of suppuration; and, that when in a state of suppuration, they will heal better if the patient be not subjected to a strong mercurial irritation. He observes, that buboes of this nature are often remarkably hard and indolent, without any tendency to subside or suppurate. In such cases, he says, the greatest advantage may be derived from the repeated application of blisters to the indurated bubo, which soon bring about either the dispersion, or suppuration of the tumor.*

The buboes, which arise from the primary ulcer with elevated edges, are alleged to resemble the original sore in their tendency to form projecting, or undermined edges, particularly, when much mercury is employed; and, says Mr. Car-

* Observations on the Symptoms and Specific Distinctions of Venereal Diseases, p. 21.

michael, if these edges are not removed by art, the disease may remain for months, and perhaps years, without healing. He prefers the knife for their removal, as caustic is too slow in its effect; and by this plan he has got many cases well in five or six weeks, which would have resisted any other mode of practice as many months. Full courses of mercury always increase their tendency to *burrow*, and not unfrequently produce dreadful mischief; the integuments even up to the navel being undermined or destroyed. He met with eight or ten ulcers, situated either on 'the groins, pubes, or scrotum and fossa of the nates, or on all these parts at once in the same individual, and resembling in their raised edges and obstinate nature the primary ulcer of this description. He describes them as creeping on slowly, with margins both raised and undermined; and expresses doubts, whether they should be considered as primary, or secondary ulcers, though he inclines to the former opinion, as they were never accompanied with any other symptoms indicating a general affection of the system. In all the cases, the patients had used large quantities of mercury, and one might therefore regard such ulcers as mercurial, if they were ever observed to arise from the exhibition of mercury for any diseases which were not venereal. Under every mode of treatment, they are obstinate; and, according to Mr. Carmichael, caustic and irritating applications are always injurious. The patient, he says, often recovers under the use of sarsaparilla, country air, and sea-bathing. One very tedious case yielded to Fowler's solution of arsenic, and pressure on the diseased parts with straps spread with equal parts of soap and strengthening plaster.*

SECONDARY SYMPTOMS.

Mr. Hunter describes the first order of parts which become diseased, in consequence of the diffusion of the virus through the system, as consisting of the skin, tonsils, nose, throat, inside of the mouth, and sometimes the tongue. The second order of parts, or those which are affected in the latter stage of lues venerea, comprehend the periosteum, fasciæ, and bones. This description can only relate to true syphilis, and indeed, of the accuracy of the latter part of the account, doubts must be entertained, if it be established that nodes hardly ever happen in syphilis, unless mercury be employed.

At first, the skin of every part of the body is generally

* Obs. on the Symptoms, &c. of Ven. Diseases, p. 56.

mottled with discolorations, many of which disappear;* while others continue and increase. In other examples, distinct blotches occur, which are sometimes not observed till the scurfs are forming. In certain cases, the eruptions come out in the form of small distinct inflammations, containing matter, and resembling pimples; but not so pyramidical, nor so red at the base.

A copper-coloured, dry, inelastic cuticle, forms. This is thrown off, and a new scurf of the same kind is regenerated. These appearances spread to the breadth of a six-pence; but seldom more extensively, at least for a considerable time. Every succeeding scurf becomes thicker and thicker, till at last it becomes a common scab, and matter forms in the cutis underneath, so that, at last, the blotch becomes a true ulcer, which usually spreads, although slowly.

According to Mr. Carmichael, when absorption of the syphilitic virus into the system takes place, ulceration of the throat is the earliest indication of the general disease; but "the eruption in the skin is usually considered the first of the constitutional symptoms; and this, when truly syphilitic, is scaly; a circumstance, by which it may be distinguished from the eruptions of the pseudosyphilitic diseases, which are either papular, pustular, or tubercular."† He describes the eruption as always consisting of scaly blotches, presenting either the character of lepra, or that of psoriasis, and unattended with any obvious degree of fever. He represents this as the eruption which follows the absorption of the virus of a true chancre. From a simple primary ulcer, patchy excoriation attended with discharge, or gonorrhœa virulenta, the eruption is papular,‡ preceded by fever, and ending in desquamation. From the ulcer with elevated edges, without induration, the eruption is of pustules, in general phlyzacious, preceded by fever, and terminating in ulcers, covered with thin crusts, that heal from their margins, and when the disease is on the wane, the eruption desquamates into scaly red blotches; while the eruption, consequent to a primary phagedenic ulcer, consists of tuber-

* Though such is the observation of Mr. Hunter, I have known eminent surgeons immediately pronounce an eruption not to be venereal, if any part of it died away, without the interference of mercury.

† Essay on the Venereal Diseases, which have been confounded with Syphilis, &c. p. 39.

‡ In Mr. Rose's investigations, "it appears, that most of the papular eruptions followed ulcers which were not very deep, and which healed without difficulty." However, he could not discover any uniform character in the sores, by which these papular eruptions were preceded. See *Med. Chir. Trans.* vol. viii. p. 399.

cles, or spots of a pustular tendency, or both intermixed, preceded by fever, and terminating in ulcers, covered with thick crusts, which often assume a conical form, healing from their centre, and extending with a phagedenic margin. In the decline of the disease, this eruption also desquamates into scaly red blotches.* Very able men, however, dissent from the inference, that no eruption is to be regarded as syphilitic, which is not scaly. They assert, that a primary sore on the genitals, having none of the characters of a true chancre, will produce constitutional symptoms, attended with copper-coloured eruptions, resembling those of syphilis, but curable without mercury; and that while these eruptions are sometimes even scaly,† true syphilitic eruptions sometimes assume the pustular form.‡ But, before we pronounce Mr. Carmichael wrong, I think we should follow exactly the line of discrimination which he has recommended; for, in particular stages of the disease, we find, that he himself represents certain eruptions as becoming scaly, which he does not regard as syphilitic. We should consider, as he expressly directs, whether the eruption is scaly from the first, or not; whether it is preceded with fever; whether the affection of the throat differs from what is usually considered syphilitic; and what is the nature of the pains of the limbs? If we compare all these symptoms, as described by Dr. Bateman,§ with the criteria of syphilis, particularly insisted on by Mr. Carmichael, we shall immediately perceive, that the latter gentleman would not have hesitated a moment about excluding such cases from the class of true syphilitic eruptions.

VENEREAL SORE THROAT.

In the throat, tonsils, and inside of the mouth, lues venerea generally makes its appearance as an ulcer, without much previous swelling. Common inflammation of the tonsils often suppurates in the centre, so as to form an abscess, which bursts by a small opening; but this complaint never looks

* See Synopsis in Carmichael's Obs. on the Symptoms and Specific Distinctions of Venereal Diseases, &c. 8vo. Dublin, 1818.

† See Bateman's Hist. of a Tubercular Eruption of Syphilitic Appearance, but curable without mercury, in Med. Chir. Trans. vol. v. p. 225.

‡ See Lond. Med. Repository, vol. iv. p. 316.

§ Med. Chir. Trans. vol. v. pp. 226, 227. Mr. Rose has repeatedly seen the scaly blotch, in cases where mercury had been freely employed for the primary sores, and where he considered the virus as eradicated, disappear under the use of sarsaparilla. See Med. Chir. Trans. vol. viii. p. 421.

like an ulcer, which begins on the surface, like the true venereal sore ; it is always attended with too much inflammation, pain, and swelling, to be venereal, and immediately the little abscess bursts, the swelling subsides. The complaint is also generally attended with febrile symptoms.

Another disease, is an indolent enlargement of the tonsils, which is peculiar to persons disposed to scrofula. Portions of thick mucus, or perhaps coagulating lymph, lie upon the surface of the tonsils, and are frequently mistaken for sloughs or ulcers. When doubts exist, they may be cleared away by removing the thickened mucus with a probe.

An ulcerous excoriation of the tonsils is another disease, liable to be mistaken for a venereal ulcer of these parts. This sometimes becomes very broad and foul, having a regular margin ; but never extending deeply into the substance of the parts, like the venereal ulcer. If the observations of Mr. Carmichael be correct, excoriation of the fauces is mostly a consequence of the simple primary ulcer, patchy excoriation of the prepuce, or gonorrhœa virulenta, being the cases which he represents as giving origin to the class of symptoms, which he distinguishes by the name of the *papular venereal disease*. When the primary ulcer, with elevated edges, but without induration, is followed by sore throat, Mr. Carmichael finds, that the ulcers affect different parts of the fauces, and are in general of a white aphthous appearance. This is the sore throat, which he describes, as accompanying what he names the *pustular venereal disease*. In the *phagedenic venereal disease* of the same author, the ulcers of the throat also affect different parts of the fauces, and particularly the back of the pharynx, frequently occupying the whole of the fauces, and sometimes extending to the nares and larynx. The affection of the throat is “a white slimy-looking ulceration.” The velum and uvula are occasionally destroyed, “so that in looking into the mouth of a person in this lamentable state, there appears one vast continuous ulcerated cavity, covered with white viscid matter, and extending from the palate to the lower part of the pharynx.”

The true venereal ulcer is represented by Hunter as a fair loss of substance, part being, as it were, dug out of the body of the tonsil. It has a defined edge, and is commonly very foul, having thick white matter adhering to it, like a slough, which cannot be washed away.

This excavated ulcer of the tonsils, however, is not at present universally regarded as a symptom peculiar to syphilis. Mr. Rose has repeatedly seen such a throat cured by sarsapa-

rilla.* Mr. Carmichael, in acknowledging the correctness of Mr. Rose's observation, tells us, that since the publication of the Essay, he has often noticed the excavated ulcer of the tonsils, "either attending the primary phagedenic ulcer, or the train of constitutional symptoms arising from it."†

NODES.

The swellings of the periosteum, tendons, and bones, arising from syphilis, are so called. Their progress is extremely slow, and attended with little pain. In some cases, however, the pain is considerable, particularly in the night-time. They continue a long time before matter forms, and then suppuration is very imperfect.

Sudden swellings of the periosteum, without nocturnal pains, are not venereal. Syphilitic nodes are described by Mr. Carmichael as indolent, slowly-increasing swellings, attended with little pain and inflammation, until in an advanced state. On the contrary, the nodes of diseases, liable to be mistaken for syphilis, seem in the first instance to affect the periosteum and soft parts covering the bone, and not the bone itself, as swelling and redness of the integuments are seen from the very commencement. These swellings arise suddenly, increase with rapidity, and frequently disappear without mercury, as quickly as they arose. In short, they are of a much more inflammatory character, than syphilitic nodes.‡

A very curious fact appears now to be established, viz. that nodes, corresponding to the description of those of syphilis, very rarely occur, except in patients who have used mercury for the cure of other venereal symptoms. The evidence derived from the late extensive investigations in military hospitals, all tends to the confirmation of this interesting point, of which the explanation is difficult, without supposing that mercury itself has the power of causing nodes; a conjecture refuted by the fact, that except in syphilis, or its resembling diseases, we rarely or never see such an effect on the bones produced by mercury, however long and freely it may have been employed.

The superficial bones are most liable to syphilitic nodes;

* Med. Chir. Trans. vol. viii. p. 421.

† Obs. on the Symptoms, &c. of Venereal Diseases, &c. p. 17.

‡ Essay on the Diseases which have been confounded with Syphilis, &c. p. 45.

for instance, the front surface of the tibia, the bones of the cranium, the triangular part of the ulna below the olecranon, &c.

TREATMENT OF SECONDARY SYMPTOMS.

The important fact, of late so unequivocally developed, that both the primary and secondary symptoms of syphilis may generally be cured without the aid of mercury, must of course be followed by an absolute rejection of the claim of that medicine to the character of being the specific for this disease; or the only remedy by which it can be cured. This position I hold to be incontestable, without the other distinct and different questions, concerning the utility of mercury in syphilis, and the propriety of renouncing its exhibition, being at all involved in the statement. That mercury generally expedites the cure, both of the primary and secondary symptoms of syphilis, or the scaly venereal disease, is another truth amply confirmed. Yet, we are not to forget, that, in some states of the constitution, even when true syphilitic affections are present, or when ulcers, which were originally of this nature, have assumed the phagedenic, or sloughing form, mercury is of all medicines the most unfit medicine to be prescribed, as instead of promoting the cure, it increases, in a most dangerous manner, both the bad state of the health, and the ravages of the local disease. In making also a due discrimination, between the uses and abuses of mercury, we should ever be mindful of the undisputed facts, that mercury generally benefits not only the ordinary forms of syphilis, but a great many other diseases, both of a somewhat resembling, or totally different description; that a vast number of these disorders, whether cured under the use of mercury, sarsaparilla, guaiacum, antimonials, the mineral acids, the nitro-muriatic baths, sea-bathing, or change of air, would in the end get well of themselves, or by the powers of nature, if the constitution could last long enough; that the efficacy of such means therefore is mostly limited to the abbreviation of these complaints; and that with respect to mercury, or any other potent remedy, if it be not administered in such quantities as dangerously to impair the health, it will not usually hinder any sores, or other complaints, from getting well, which are disposed to undergo a spontaneous cure.

We shall admit as the common belief, then, that mercury, though not essential to the cure of all those forms of disease, which are regarded as truly syphilitic, generally abridges their duration, and that on account of this important degree

of utility, its exhibition in moderation is right and advantageous.

It may be conveyed into the system, either externally by the skin, or internally by the mouth. In particular constitutions, mercury employed in one way seems to have no effect on the constitution or disease, and then it must be tried in the other. In the same manner, when one preparation of the medicine proves ineffectual, another should be tried, as the change is frequently followed by beneficial effects on the disease.

Sometimes the bowels can hardly bear mercury, and, in this circumstance, it is to be given in the mildest form possible, conjoined with other remedies for diminishing its bad effects on the viscera.

In general, the external employment of mercury is the most advantageous and convenient.

In giving mercury, the first attention should be to the quantity, and its visible effects at a given time; for when those effects have attained a certain pitch, they are not to be increased, but only kept up, while the decline of the disease is watched.

The visible effects of mercury are of two kinds; the one on the constitution, the other on parts capable of secretion. In the first, it appears to produce universal irritability, a quick pulse, &c. Salivation, or an extraordinary secretion of saliva, attended with soreness of the gums and mouth, forms the second description of effects. The latter affection is the criterion, by which practitioners have generally calculated the influence which mercury has over the whole constitution; but, from the facts already explained, it is a criterion, which should be no longer adopted, as the cure of syphilitic affections may generally be accomplished without subjecting the patient to all the distress and impairment of health attendant on salivation. But, if it be deemed proper in some cases to resort to this test, the mercury should always be introduced into the system gradually, beginning with small quantities, which may afterwards be increased. At first, one scruple, or half a drachm of mercurial ointment, may be rubbed in every night; and if the mouth in a moderate time should not be affected, the quantity must be gradually increased to one drachm or more.

When mercury is given internally, and salivation is aimed at, there are three preparations commonly preferred in syphilitic cases; the pil. hydrarg. which may be given in the dose of gr. x. every night, either with or without opium, as circumstances may indicate; the oxydum rubrum in the dose of

gr. i. with or without opium; and lastly, a solution of the oxymuriate of mercury, (sublimate.) One-sixth of a grain dissolved in brandy, or any aromatic water, or made up into a pill, and given twice a day, is the usual dose. When it is intended, however, only to put the patient on an alterative course, the doses need not be so large, nor frequent; and the submuriate is very commonly preferred.

With respect to the preparation of mercury, in unequivocal cases of syphilis, the most simple are reckoned the best, not only in consequence of their acting with least violence on the system, but also because they prove most efficacious in the cure of the disease. Hence, frictions with the ointment, and the exhibition of the pil. hydrarg. are the most common plans.

It is incumbent on me to mention fumigation, another mode of introducing mercury into the constitution through the skin. It is one of the most ancient forms of administering this medicine, and was much praised in France by M. Lalouette. Mr. Abernethy, who published a description of its advantages, recommends a powder for the purpose, made by agitating the submuriate of mercury in water, mixed with the liquor ammoniæ carbonatis. The patient is placed in a machine, not unlike a sedan-chair, but having an opening at the top, out of which he can conveniently put his head. A heated iron is placed at the bottom of it, and when the powder is thrown on the hot surface of the iron, it sublimes, and is deposited on the surface of the patient's body. The patient afterwards puts on his flannel waistcoat and drawers. No doubt, it would be quite sufficient to fumigate the inside of the clothes, and then let them be put on with care.

Besides mercurial fumigations applied to the whole surface of the body, with the view of affecting the constitution, some practitioners place considerable reliance in the efficacy of topical fumigations with the hydrargyri sulphuretum rubrum, for improving the appearance, and inducing a healing disposition in certain primary as well as secondary syphilitic ulcers, which are backward in yielding to the ordinary employment of mercury. In the shops may be procured an apparatus, consisting of a stand, an iron heater on which the mercurial powder is thrown, and a tube for conducting the smoke to the part affected.

With respect to the principle on which mercury acts, the Hunterians suppose, that it cures syphilis, not by any chemical operation, but by exciting, in the constitution and parts affected, a particular action, which overcomes and removes that of syphilitic disease.

At the commencement of this chapter, some of the leading Hunterian principles, on which the treatment of the venereal disease is to be regulated, have been already mentioned. According to Dr. Adams, whenever we have cured a patient of the first local symptoms, we may assure him, that as long as he keeps out of the way of mischief, he is free from all danger of a relapse in those parts which have been cured; but we cannot pretend to inform him, whether the disease will yet appear in his throat, skin, or bones. This uncertainty must remain for a few months, after the chancre or bubo has been cured.* So when the disease has reappeared in the skin or throat, and been cured, we cannot say, whether it will afterwards show itself in the bones, though we know it will not again do so in the skin or throat. But when the primary complaints, and the secondary in the skin, throat, and bones, have all appeared, and been cured, we may regard the patient as free from the danger of future symptoms from the same stock of infection. As I have already related, the Hunterians explain most of the preceding circumstances, by supposing mercury to have no power of curing the disposition to the disease, but only the action or the palpable and perceptible forms of the distemper; and, by laying it down as a law of this disease, that the same order of parts can never be affected more than once from the same stock of infection.

With respect to syphilitic nodes, mercury is frequently incapable of removing the whole of the swelling: in such cases, blisters applied over the tumor, and kept open with the savin cerate, are highly beneficial.†

In the treatment of the constitutional symptoms, described by Mr. Carmichael as proceeding from the simple primary ulcer, patchy excoriation attended with discharge, or gonorrhoea virulenta, this gentleman has recourse to blood-letting when the fever is considerable, the pulse full and strong, and the tongue furred, with severe pains of the joints. He then opens the bowels and the skin by antimonials, and "when the febrile symptoms are reduced," throws in the simple or compound decoctions of sarsaparilla with antimonials, occasionally giving "the mercurial salts in alterative doses," when

* Observations on Morbid Poison, pp. 163, 164, edit. 2; and the Comment. on Hunter's Treatise on the Venereal Disease.

† } In the American Medical Recorder, vol. iv. 1820, Samuel Colhoun, M. D. of Philadelphia, published an account of several cases of nodes which were effectually cured by the use of Fowler's solution of arsenic, in doses of 10 drops three times a day. }

the disease is completely on the decline. When iritis, however, is a consequence of these primary affections, he recommends the free use of mercury, until the inflammation is subdued.

When there are phagedenic symptoms, Mr. Carmichael's practice is first to subdue the febrile excitement by blood-letting, daily repeated until the pain and fever have abated; and he prescribes antimonials in nauseating doses, and opium; at the same time applying to the sores warm fomentations, with poultices of bread and water, or bread and a solution of opium; and confining the patient to bed, with the penis supported in the most easy and convenient manner. Cicuta in large doses, and decoction of sarsaparilla, are afterwards given, "when the primary ulcer is accompanied with constitutional symptoms;" but when there are only constitutional symptoms, he prescribes "the decoction of the woods alone, or conjoined with antimony, or compound powder of ipecacuanha, or muriate of mercury." During the co-existence of the fever and tubercular eruption, or spots of a pustular tendency, Mr. Carmichael is an advocate for blood-letting; and, besides the general means recommended in his Essay, sometimes employs arseniate of kali, nitrous acid, and nitro-muriatic baths. For phagedenic ulcers in the throat, he praises the same general treatment, with the application of oxymel æruginis, a strong solution of muriate of mercury, or nitrate of silver, or fumigations with the sulphuret of mercury. Should these remedies fail, "mercury may be used largely with advantage in checking the progress of the ulceration, even though it should exasperate the general disease." This mineral, he observes, increases the ravages of the disease in all its stages but the last. For ulceration and caries, the same plans are also recommended, and the pains in the joints and nodes are to be treated like those resulting from the primary ulcer with elevated edges.*†

For the secondary symptoms, proceeding from the ulcer with elevated edges, without induration, and characterized by a pustular eruption, Mr. Carmichael advises blood-letting during the febrile state, followed by antimonials, sarsaparilla, guaiacum, tar-ointment, baths of sulphurated kali, or nitro-muriatic baths. Mercury, he says, is decidedly pernicious,

* Obs. on the Symptoms, &c. of Ven. Diseases.

† {In sloughing phagedena, as about the perineum, or on the penis, &c. which tends to a rapid destruction of a great extent of surface, the application of the undiluted nitric acid, as recommended by Mr. Welbank, will put a speedy stop to the sloughing, pain, &c. The chlorides of lime and soda are also used by the English surgeons.}

until the pustules terminate in scaly blotches, instead of forming ulcers; and then mercurials, in alterative doses, conjoined with sarsaparilla and guaiacum, may occasionally be employed with benefit. The same general treatment is recommended for the white aphthous sore throat, often attendant on this form of disease, with common detergent or mercurial gargles; oxymel æruginis, and fumigations of the sores with the sulphuret of mercury. For the pains in the joints, Mr. Carmichael praises the same constitutional treatment, together with leeches, fomentations, bread and water poultices, blisters, and ointment of tartarized antimony. But mercury, he says, should be particularly avoided while inflammation of the knee exists. As for the nodes, resulting from the primary ulcer with elevated edges, he recommends the same general and local means, and sometimes a division of the periosteum. When the preceding means prove insufficient, and the disease is on the decline, he allows that a mercurial course may be of advantage.

The same writer has treated of "anomalous disorders resembling the phagedenic disease, yet not of venereal origin." He adverts to Mr. Abernethy's doctrines, respecting the connexion between disorders of the digestive organs and the production of local diseases, admitting, with the latter gentleman, that the surest method of curing these complaints is by improving the digestion and health in general. If, however, there should be an extensive and rapidly spreading ulcer of the throat, he thinks the treatment should be more active, and precisely such as he has recommended for those ulcers of the throat which attend the phagedenic disease, to which he has seen these spontaneous ulcers bear so strong a resemblance that it was impossible for the eye to discover the difference. In most of the instances which he has seen, the eruption also possessed a strong resemblance to the large tubercular eruption, which he describes as often following the primary phagedenic ulcer; and extending into ulcers, with irregular, jagged, undermined edges, and generally best cured with nitrous acid, or sometimes with small doses of blue pill, or of the muriate of mercury, joined with sarsaparilla. Mr. Carmichael recommends the same general treatment for spontaneous nodes, with leeches and blisters; and if these means fail, he divides the periosteum, which, he says, is usually found much thickened.*

* See NOTE P.

CHAPTER XXIX.

ANEURISM.

AN aneurism is generally a pulsating tumor, arising from a dilated, ruptured, or wounded artery, and filled with blood, which, in the early stage, is in a fluid, and at a later period, in a more or less coagulated state. It originates either from an alteration of structure and consequent dilatation of the several coats of a part of an artery, or from a dilatation of the external tunic alone, the inner coats having previously given way in consequence of disease or violence.* These forms of the complaint constitute the cases which, I think, ought still to be called *true aneurisms*, in which the sac is really a dilated part of the artery itself. When all the coats of an artery are wounded, ruptured, or perforated by ulceration, the tumor is called a *false aneurism*. Here the blood is either extensively injected into the cellular membrane, the case being named accordingly a *diffused false aneurism*; or it is collected in one mass, which is bounded by a kind of cyst, soon formed around it by the adhesive inflammation: this is the *circumscribed false aneurism*.

An aneurismal swelling, which arises directly from a wound or breach extending through all the coats of the artery, is sometimes known by the appellation of a *primitive false aneurism*; while other cases, which either began with a destruction of the inner coats, and terminated in the giving way of the external coat, or which began with dilatation, and ended in a rupture of all the tunics, are termed *secondary false aneurisms*.†

* Some writers mention a wound of the outer coats of an artery, and the dilatation of the inner tunic. Arnaud calls this case *hernia arteriae*. In 1804, Dubois demonstrated to the Ecole de Médecine at Paris, two specimens of the *aneurysma herniosum*, which were found in the thoracic and abdominal aorta of the dead subject, and of course, could not have arisen from any partial wound. It was imagined, that these cases had arisen from the destruction of the external and middle coats by ulceration; and as such a disease is perhaps never seen in other arteries, its occurrence in the aorta is referred to its lining being more elastic than that of smaller arteries. See Dict. des Sciences Méd. t. ii. p. 112.

† Dr. Aug. Frid. Ayer über die Pulsadergeschwülste, p. 19. Göttingen, 1800. Also, C. D. Kuhlmann de Aneurysmate Externo, p. 4. 4to. Jenæ, 1816.

If a direct communication be formed between a large artery and its accompanying vein, as sometimes happens in venesection, when the lancet transfixes the vein and opens the subjacent artery, the wound in the skin may heal up, while the opening between the vein and artery may continue permanent, the arterial blood gushing into the former vessel at each pulsation of the heart, and producing in a very short time a remarkable varicose swelling, accompanied with peculiar symptoms. Such is the nature of the *varicose aneurism*, or *aneurismal varix*. Lastly, the *aneurism by anastomosis*,* is totally different from any of the preceding forms of disease, as it proceeds from a morbid growth, or dilatation of the arterial ramifications, by which a highly vascular substance is produced, which has a singular propensity to increase to a great and dangerous extent, and which, when cut or broken, bleeds with incredible obstinacy.

According to the observations of Scarpa, aneurism, in whatever part of the body it is formed, and from whatever cause it arises, is never occasioned by the dilatation, but by the rupture, or ulceration of the internal and muscular coats of the artery, and, consequently, these coats have not the smallest share in the formation of the aneurismal sac, which, he observes, is undoubtedly composed of the cellular sheath, which the artery receives in common with the parts contiguous to it.†

He completely disapproves of the division of aneurisms into true and false, as totally incorrect, not admitting, even as an exception, the case which I have mentioned, as accompanied with a dilatation of the external coat alone, and a rupture or ulceration of the middle and inner tunics.

At first, the reason of Scarpa's sentiment upon this latter point seems obscure, until he takes an opportunity of explaining, that he does not agree with the generality of anatomists in considering the covering of an artery as one of its proper coats, but merely as an adventitious sheath, or cellular investment, which the artery receives in common with the parts in the vicinity of which it runs.‡ But, here the question seems, not about the state of what is called the *sheath* of the artery in a certain form of aneurism, but about the condition of its *external or elastic coats*, in the same disease.

* See John Bell's Principles of Surgery, vol. ii. p. 456.

† See Transl. by Wishart, p. 113.

‡ On the Anatomy, Pathology, &c. of Aneurism, transl. by Wishart, p. 69.

As Dr. Jones remarks, the external tunic derives from the particular arrangement of its component fibres a characteristic appearance, which distinguishes it from cellular membrane, and entitles it to be ranked as a *proper* coat of an artery. Having described its whiteness, density, great elasticity, &c., he then notices the *sheaths*, in which the arteries are contained while in their natural situations, and to which they are connected by means of fine cellular membrane.* Hence, when Scarpa specifies the invariable ulceration or rupture of the muscular and internal coats, in proof of the impossibility of a true aneurism, he is passing over that form of true aneurism in which the external coat of the vessel is dilated.

The attention of several eminent surgeons has been of late particularly directed to the question before us,—whether any aneurisms really consist of a dilatation of the arterial coats, without a rupture or ulceration of all the three coats together, or of the two internal coats by themselves. The results of these investigations are quite adverse to the side which Scarpa has espoused; and the doctrine of true aneurisms, or aneurisms by dilatation, is still most respectably, and, I believe, successfully defended.† “My own observations (says Mr. Hodgson) will not allow me to coincide with Scarpa, in defining aneurism to be constantly produced by the destruction of the coats of an artery. On the contrary, the inspection of innumerable preparations of this disease, contained in the principal museums of this metropolis, and the more minute examination by dissection of various specimens of diseased arteries, and of aneurisms in the different stages of their formation, have produced a conviction in my mind, that, although in most aneurismal sacs, especially in those which have arrived at a considerable size, the coats of the vessel have given way, yet, in a great proportion of aneurisms, the disease commenced in a partial dilatation of the coats of the artery.” We are not to suppose, however, that Scarpa means to exclude a preternatural dilatation from the catalogue of diseases to which the arteries are liable; on the contrary, in several parts of his writings, he speaks of a yielding of the arterial coats with a weakening of a part, or of

* On the Process employed by Nature in suppressing the Hemorrhage from divided and punctured Arteries, &c. 8vo. Lond. 1805, p. 3.

† Ueber die Pulsadergeschwülste von A. Scarpa; Zurich, 1808, mit Anmerk und Zusätzen von Christ. Fr. Harles, p. 299, &c. Hodgson's Treatise on the Diseases of Arteries and Veins, &c. 8vo. Lond. 1815, p. 59, &c. Kreyzig, Ueber die Krankheiten des Herzens, theil ii. abth. 1. Berlin, 1815, p. 381, &c. Spangenberg, in Horn's Archiv. für Med. Erfahrung, 1815, heft. 2.

the whole circumference of the artery. But, such morbid dilatation he always considers as a disease totally distinct and different in many particulars from aneurism.* The root of an aneurism of the aorta, says Scarpa, in whatever point of this artery it appears, never includes the whole circumference of the tube of the artery, but constantly occupies and involves only the one or the other side of the artery, from which side the aneurismal sac rises and enlarges in the form of an appendix or tuberosity, more or less large and extended, according to the circumstances of the place, or of the period of the disease; while, on the contrary, the dilatation of the artery, occurs constantly in the whole circumference of the tube, and therefore differs essentially from aneurism.† The dilatation of an artery, he says, is not an affection, properly speaking, organic, as the blood is always contained within the cavity of the vessel; in the track of the expanded artery, no masses nor layers of grumous blood are ever found, as in aneurism; the dilatation never forms a tumor of considerable bulk; and, as long as the continuity of the proper coats of the artery remains uninterrupted, the circulation of the blood is not perceptibly changed.‡ There can be no doubt, I think, respecting the reality of the differences between aneurism and the dilatation of an artery, and that circumstances appear fully to warrant a distinction. Yet, I cannot omit this opportunity of condemning all attempts to generalize too much,—a desire which often leads men of the most distinguished talents into error. Thus, Scarpa not only contradicts himself, with respect to the question, whether dilatation always includes the whole periphery of the artery or not; but, he falls into another inconsistency, for we find him, in one place, asserting that by dilatation a swelling of large size can never be formed, yet afterwards, himself adduces a morbid dilatation of the arch of the aorta, where the tumor was six inches in length

* Memoria sulla Legatura delle Principali Arterie degli Arti, con una Appendice all' opera sull' Aneurisma, p. 87, &c. fol. Pavia, 1817. Here I find Scarpa admits the occurrence of dilatation at a part of the circumference of the artery,—a point which, as appears from the quotation I next cite, he positively denies in the first part of his work. "Sometimes (says an accurate writer) the dilatation is partial, and occupies only one side of the vessel." Hodgson on Diseases of Arteries, &c. p. 47.

† In the appendix, p. 92, published 1817, Scarpa speaks of dilatations on the arch of the aorta, which were not larger than half a bean, and which, of course, could not affect the whole circumference of the vessel. These, however, are said to have had the other distinguishing characters of dilatation.

‡ See Scarpa's Treatise on Aneurism, transl. by Wishart, pp. 56, 57

and five in breadth.* The case is mentioned to prove the inaccuracy of the common conjecture, that coagulated blood is only found in large dilatations of the arteries, and not in smaller tumors of this nature. In the considerable swelling, here specified, there was not the least vestige of the lamellated coagulum, which is constantly found in aneurism.

In aneurism, the blood passes into a cavity, which is, as it were, out of the track of the circulation; there its course is retarded; and there it invariably deposits lamellated coagula, and sometimes in such quantity as entirely to fill the cyst. If, says Scarpa, any breaches of continuity happen in the inner surface of a morbid dilatation, it is only within the cavities of such solutions of continuity and roughnesses that coagula are deposited,† and all the rest of the inner surface of the disease is entirely free from them. These solutions of continuity and inequalities on the inside of a dilated artery, Scarpa very justly regards rather as the beginning of another disease, totally different from dilatation, viz. of aneurism formed consecutively to this latter affection. Mr. Hodgson, who has given a very correct account of the changes in a dilated artery, observes that smaller sacs or pouches often grow from the sides of the great cyst, and are lined with a calcareous crust; and that, in other instances, the dilated coats appear to have given way at some point, and an aneurism is thus, as it were, ingrafted upon the dilated artery.‡

Besides these distinguishing characters of the two diseases, modern pathologists advert to others, not less worthy of notice. When the morbid dilatation of an artery is partial, or confined to one side of the vessel, resembling a thimble in shape, the opening through which the blood passes into the cyst is as large as the fundus of the cyst itself. And, when the dilatation occupies the whole circumference of the arterial tube, the tumor, thus produced, constantly has a cylindrical or oval shape; and if it be so situated as to admit of being compressed, it readily yields to the pressure, and almost disappears; while in the dead subject it seems much smaller than in the living. But aneurism, says Scarpa, presents entirely a different aspect. Whether preceded by a dilatation of the proper coats of the artery or not, its origin is always on one side of the vessel. Its neck, or that part, through which the blood must pass in order to get into its cavity, is more nar-

* Mem. sulla Legatura, &c. p. 90.

† See Case in A. Burns on Diseases of the Heart, p. 206

‡ Hodgson, op. cit. p. 46, also p. 72, &c.

row than the rest of the aneurismal pouch. The swelling has an irregular shape, yields under pressure with difficulty, and is nearly of the same size both in the living and the dead subject. Lastly, while the preternatural dilatation of an artery is increasing in size, the proper coats of the vessel grow thinner and thinner; but in proportion as an aneurism gets larger, the thickness of its sac is augmented.*

When such cases are situated in the chest or abdomen, they cannot, of course, be distinguished from each other by the symptoms; but, fortunately, the means for palliating the two diseases, and retarding their sad consequences, are the same. The event of the two cases, however, may differ very much; for, as Scarpa remarks, if the case be an internal aneurism, some very slight hope may be indulged, that a radical cure will be effected by nature or art; which hope, however, can never be entertained in any instance of morbid dilatation. Experience proves, says he, that the *spontaneous* cure of an internal aneurism may happen, whenever the impetus of the circulation is lessened, and the lamellated coagula completely fill up the aneurismal sac. When this is accomplished, nature finishes the rest of the cure, just as she does when the main artery of a limb is tied; with this difference, that in an *internal* aneurism, the coagulum shuts up the burst side of the artery, without intercepting the course of the blood through the vessel; while, in an *external* aneurism, the coagulum plugs up the sac and tube of the artery both together. This fortunate combination of things cannot be hoped for in cases of dilatation, because however diminished the force of the circulation may be, coagulated blood is never deposited in a pouch, that consists of a preternatural expansion of the proper coats of an artery.†

Whether aneurism begin with dilatation or not, in the end there is almost constantly a rupture or ulceration of all the coats of the artery. In most instances, the aneurism is formed by a destruction of the internal and middle coats of the vessel, and the expansion of the external coat into a sac, which at last giving way, the sheath of the artery and the surrounding parts form the boundary of the tumor. On the other hand, the sac which is formed by the dilatation of all the coats of an artery, as it advances in size, contracts firm adhesions to the parts which are in its immediate vicinity; so that when the dilated coats give way, the effusion of blood is

* Scarpa in Memoria sulla Legatura delle Principali Arterie, &c. p. 93.

† Scarpa, op. cit. pp. 94—98.

restrained by these adhesions, or rather by the timely effects of new adhesive inflammation, and, as Mr. Hodgson observes, the sac then continues to be formed in the same manner as when an aneurism is in the first instance produced by destruction of the coats of the vessel. Sometimes, however, the sac bursts so suddenly, that the adhesive inflammation has not time enough to circumscribe the hemorrhage, and a diffused extravasation follows.*

A pulsating tumor, near a large artery, is always a sufficient reason for suspecting the disease to be aneurism; but, as other swellings, and even abscesses in the vicinity of an important artery, sometimes have a throbbing motion communicated to them by the neighbouring vessel, no positive judgment should be formed, until other circumstances of the case have been duly considered. I once saw a large abscess, at the side of the lumbar vertebræ, in a blue-coat boy, where the tumor pulsated with as much force as any aneurism which I have ever examined. An abscess, that occurred in a case of fractured sternum, had as regular a contraction and dilatation as the heart itself or the aorta could be supposed to have. Upon pressure, the tumor receded; upon a removal of the pressure it immediately resumed its former size. At length it burst; discharged a considerable quantity of matter; and the patient recovered.† In a case of glandular tumor, situated over the carotid artery, Sir A. Cooper readily distinguished the nature of the disease, by the line of pulsation caused by the artery, as the lateral parts of the swelling had no pulsation. He observes, that, when a tumor lies over an artery, and derives pulsation from it, the case may be discriminated from aneurism, by raising the swelling from the vessel, by which means the tumor is deprived of its pulsation. In a doubtful case of aneurism in the groin, Mr. Brodie found all ambiguity cease on applying the stethoscope.‡ In order to discriminate certain pulsating tumors from aneurisms, writers direct us to recollect, that in the first cases, the alternate rise and fall of the swelling amount to a real change of situation; while in an aneurism, the motion proceeds from an alternate dilatation and contraction of the tumor at every point of it.§ I confess, however, that the recollection of this fact has not seemed to me to facilitate the diagnosis in actual practice;

* See Hodgson on Diseases of Arteries, p. 71.

† Warner's Cases in Surgery, 8vo. Lond. 1784, edit. 4. p. 155.

‡ Lectures, &c. vol. ii. p. 46.

§ Dict. des Sciences Med. t. ii. p. 91.

for it is often equally difficult to pronounce, whether what we see is a displacement of the swelling, or only an expansion of it.

In cases of diffused false aneurism, the pulsation is generally indistinct, and often quite imperceptible. Warner relates an instructive example of this total absence of pulsation. The case was a large diffused false aneurism. The thigh was enlarged to a very great size. The tumor was uniform, and extended from the inside of the knee to within a small space of the groin. The integuments were every where of their natural colour. The inside of the thigh was soft, and presented a kind of fluctuation; but not the least pulsation could be distinguished, either here, or at any other point. The tumor, at its superior, posterior, and lateral parts, was of a stony hardness. It was judged advisable to make an incision into its most prominent part, when a stream of florid blood immediately gushed out, and evinced the true nature of the disease. As surgeons knew less then than now, how aneurisms ought to be treated, the limb of the patient was immediately amputated. The diffused nature of this aneurism, and the large quantity of coagulated blood within it, which had acquired the texture and appearance of brown macerated leather, are circumstances fully accounting for the absence of pulsation.* Pelletan tells us of a case, where an axillary aneurism, that had no pulsatory motion, was opened, from an idea that it was a collection of matter; but as the puncture was small, immediate death was prevented, by the application of sticking plaster.† I once saw a large popliteal aneurism, which extended a good way towards the front of the limb, had a very solid feel, and not the slightest pulsation. The case was considered by many other surgeons, as well as myself, to be some kind of fleshy tumor, so involving the knee-joint as to admit of no other mode of extirpation but amputation of the limb. Previously to the operation, however, an abscess lancet was deeply plunged into the tumor, without giving issue to any fluid.‡ This was an instance, in which the absence of pulsation had been caused by the cavity of the aneurism being nearly filled with coagulated blood; and if we had not formed a wrong judgment of the nature of the disease, but left the case to itself, the popliteal artery might soon have become impervious, and a spontaneous cure followed.

* Warner's Cases in Surgery, p. 159; in which work are recorded two other instances of aneurism without pulsation.

† Clinique Chirurgicale, t. ii. p. 84.

‡ Lawrence, in Medico-Chir. Trans. vol. viii. p. 497.

A true aneurism, in an external situation, generally presents itself in the form of a small pulsating tumor, which subsides under pressure, and immediately re-appears when the pressure is taken off. It also subsides, or at least becomes more flaccid, when the portion of the artery between it and the heart is compressed; but immediately resumes its usual fulness and pulsation when such compression is discontinued. In other tumors, which derive a pulsatory motion from their lying over a large artery, pressure made on the vessel completely stops their alternate elevation and depression, but they remain as tense and prominent as ever, which is not the case with aneurism. True aneurism, in its commencement, is generally little painful; and the integuments are of their natural colour. The pulsations are strong, especially while the tumor is small, and none of the coats of the vessel are yet ruptured, because, in this stage, the blood in the sac is all fluid, and no lamellated coagula are deposited upon its inner surface. The greater strength of the pulsation in true aneurisms also depends very much upon the ample and direct communication between the sac and the direct channel of the blood. In a more advanced stage, as Sir Astley Cooper has explained, the tumor is larger and more solid, and the sac cannot be completely emptied. A part of the blood in it has coagulated, and its parietes have become much thickened. The size of the swelling, and its pressure on the surrounding parts, now create pain, and obstruct the circulation. The pulsation, however, though not so strong as at first, is yet distinct. In a still further advanced stage, the size and solidity of the aneurism are more increased; the pulsation is very indistinct, and only to be felt at that part of the tumor which is opposite to the orifice in the artery. The sac is now almost filled with lamellated coagula, and contains but a small quantity of fluid blood.*

With respect to the diffused false aneurism, it generally presents but a feeble and indistinct degree of pulsation, and this only near the situation of the aperture in the artery. In consequence also of the extensive injection of the cellular membrane, with blood, the case is at the same time attended with more discoloration, than any other form of aneurism, unattended with inflammation. The history of the disease; its cause; its sudden formation, &c., also serve to throw light on the diagnosis.

* Sir A. Cooper's Lectures, vol. ii. p. 25.

Nor is the diagnosis of what is named the secondary false aneurism difficult ; for, when a case, which has been for some time attended with the symptoms of true aneurism, and restricted to a certain form, suddenly undergoes an alteration of shape, and an increase of size, either becoming more protuberant at one or more points, or more extensively diffused, (in the latter case, with a material decrease or loss of pulsation,) we have great reason to suspect, that a secondary false aneurism has been formed by the bursting of the original aneurismal sac.

By the pressure of large aneurisms, an absorption is caused of all the surrounding textures, whether bone, cartilage, muscle, &c. It is curious, however, to remark with respect to the bones, that however they may suffer in this way in case of popliteal aneurism, their condition rarely gives any trouble after the aneurism itself has been cured. This kind of caries is also peculiar in never being accompanied with suppuration : it is a simple absorption of bone.

From the increasing size of an aneurism, it produces in time severe suffering, by compressing large nerves, and even pushing them quite out of their natural situation. In internal aneurisms, in particular, a variety of evils may arise, as difficulty of deglutition from the pressure on the œsophagus ; complaints of the urinary organs from pressure on the bladder ; vomiting from pressure on the stomach ; difficulty of respiration from pressure on the lungs, or diaphragm ; or, suffocation from pressure on the trachea. Large external aneurisms also generally produce, besides great pain, a serious impediment to the passage of fluids through the lymphatics and veins of the limb, which sometimes becomes enormously enlarged by an œdematous effusion.

When an external aneurism is about to burst, the event may be foreseen by a part of the tumor becoming particularly tense, raised into a conical prominence, something like the pointing of an abscess, and presenting a thin soft feel, and a dark purple colour. On the apex of this projecting part, the cuticle separates, and a small slough forms, which generally spreads till it is of about the size of a sixpence or shilling ; and at length being loosened, or detached with the adjoining coagulum, is followed either by one copious and sudden gush of blood, that destroys life in a few instants, as I saw happen in a case of subclavian aneurism, or by repeated hemorrhages, by which the patient is more gradually exhausted. I have seen two or three cases, in which this mode of rupture was exemplified, and its correctness is confirmed by the corre-

sponding reports of some of the best writers on aneurism.* According to Mr. Hodgson, when an aneurism bursts into a cavity which is lined by a mucous membrane, like the œsophagus, intestines, bladder, &c. the breach is also produced in the same way; but when the sac projects into a cavity lined by a serous membrane, as the pleura, the peritoneum, and the pericardium, these membranes, after being rendered extremely thin, give way by laceration.

With respect to the causes of aneurism, there can be no doubt, that, with the exception of those cases which proceed from wounds, the generality of instances are preceded either by a steatomatous thickening, with ulceration of the internal coats of the artery, or by calcareous deposition between the middle and internal coats, attended with loss of elasticity in the affected part of the vessel, and a disposition to crack or give way. The blood then comes into contact with the external elastic coat, which is raised into an aneurismal swelling. At length, more or less of this coat is removed by absorption, or bursts, and the blood then receives a covering from the arterial sheath. As the disease advances, it presses upon, and causes the absorption of all the surrounding parts, and is more or less diffused or circumscribed, according as it may happen or not to be confined or bounded by an entire cyst, formed by the adhesive inflammation, the remains of the original sac, or any ligamentous expansion.

In works of the greatest accuracy, we find accounts of aneurisms which arose from violent efforts, forcible pressure on arteries, the reiterated bruising of parts, the force employed in reducing a dislocated humerus, the violence of falls, fractures, wounds,† &c. With the exception of cases, however, in which arteries are wounded with a sharp instrument, the point of a fracture, &c., together with other soft parts, aneurism seldom proceeds from external violence, unless the coats of the vessel be already in an unsound state. Mr. Hodgson never met with the laceration of the coats of an artery which had not undergone some previous morbid alteration, nor does he think it probable, that any exertion, which did not lacerate the surrounding parts, could be sufficient to rupture the coats of a healthy vessel. He also ascertained, by repeated experiments, the inaccuracy of Richerand's statement,‡ that the inner coats of the healthy popliteal artery may be ruptured

* Pelletan, *Clinique Chir.* t. ii. p. 91. Hodgson on Diseases of Arteries and Veins, p. 85. Sir A. Cooper's Lectures, vol. ii. p. 26.

† See Pelletan's *Clinique Chir.* t. i. and ii.

‡ *Nosographie Chir.* t. iv. p. 78.

by violent extensions of the leg, since the laceration never happens, unless the extension be made in such a degree as to break the ligaments of the knee-joint.*

As aneurism occurs more frequently in the large than the small arteries, it is evident, that the impetus of the blood must frequently have a considerable share in its origin. True aneurisms, as Monro thought, take place as often in the aorta, particularly its arch, as in all the other arteries together. Aneurisms also frequently occur in the ham, and wherever the arteries run unsurrounded by muscles, and are most exposed to external violence.

Patients frequently have several aneurisms at the same time. I have seen patients, who either had more aneurisms than one at the same time, or who had had other aneurismal tumors before those which I had the opportunity of observing. Sir A. Cooper has seen seven in one person.† But, the most remarkable example of a multiplicity of aneurisms is mentioned by Pelletan, who counted in one subject sixty-three, from the size of a filbert, to half that of a hen's egg.‡

The experiments of Mr. John Hunter, and Sir E. Home, decidedly prove, that a mere local weakness of a part of an artery, otherwise healthy, will not occasion the formation of aneurism. Even dissecting off the outer coats of an artery will not cause it.§

Nor is the sudden laceration of the internal and middle coats of a sound artery ever the cause of aneurism: this fact is completely proved by the experiments of Dr. Jones, as well as by what happens in the practice of surgery, where small ligatures are now so commonly employed, and sometimes have even been taken off immediately after being applied, so as to leave the cut part of the internal coats exposed to the impetus of the circulating blood. This point, I think, is well deserving attention, because the opponents of Dr. Jones's doctrines have laid some stress on the danger either of aneurismal dilatations, or the too speedy ulceration of the artery, from the effect of a small ligature in dividing the inner coat of the vessel. As when the ligature is left on the artery, a coagulum forms within it, and fluid blood no longer comes into contact with the solution of continuity, some surgeons may be inclined to impute the prevention of the dilatation of the external coat to this occurrence; but the thing cannot be entirely owing to such

* Hodgson, p. 64.

† Lectures, vol. ii. p. 37.

‡ Clinique Chir. tom. ii. p. 1.

§ See Trans. of a Society for Med. and Chir. Knowledge, vol. i. p. 144.

cause, because we find, that when the ligature is taken off immediately after its application, and the current of blood is allowed to proceed as it did previously, no aneurism is the consequence. We must, therefore, conclude, that the formation of aneurism, except where all the coats of an artery are pierced, or cut, must generally be preceded by a morbid change in them; a fact, fully confirmed by what is disclosed to us in dissection.

DIFFERENT PROCESSES BY WHICH ANEURISMS ARE CURED.

Although it is the common course of aneurisms, when they are left to themselves, to increase in size, and at length to burst, and destroy the patients by hemorrhage, sometimes things happen otherwise, and, in consequence of certain changes taking place, a spontaneous cure is the result. There are four modes, in which this desirable event may be produced. 1. Sometimes the whole aneurismal swelling suddenly inflames and sphacelates: in this state, if the inflammation extend its effects to a sufficient depth, the sac in the vicinity of the artery, and a portion of the canal of this vessel itself, may become completely blocked up with coagulating lymph, so that no more blood can get into the tumor, the pulsation of which is suppressed. In cases of this description, the mortified parts, together with the mass of congealed and sometimes putrid blood in the sac, are cast off, and if the patient's constitution hold out, the ulcer, left by the detachment of the sloughs, heals up, and the cure is completed. When, however, the inflammation and sloughing are confined to the skin and superficial portion of the sac, the patient bleeds to death on the separation of the dead part. 2. The second process, by which the spontaneous cure of an aneurism may be produced, is the increase of the lamellated coagula in such a degree within the aneurismal sac, as completely to fill it, in which case the blood also coagulates in the adjoining portion of the artery, which becomes impervious for a certain extent above and below the communication which it had with the vessel. Similar changes happen when the cure is accomplished by pressure. 3. Scarpa, and all the best modern surgical writers, until lately, supposed, that no aneurism could be cured, unless the sac and an adjoining part of the artery were thus obliterated: the facts, however, collected by Mr. Hodgson,* leave no doubt, that when an aneurism of the aorta un-

* Treatise on the Diseases of Arteries, &c. p. 117, et seq.

dergoes a cure, the sac alone may be filled up with coagula, while the vessel itself remains pervious. 4. The last manner, in which spontaneous cure may be brought about, is by the pressure of the aneurismal sac itself upon the artery. In one instance on record, this fortunate pressure of the sac followed four days after the change of a popliteal aneurism from a circumscribed to a diffused state.*

As it is from the increase of coagulated blood within the tumor, that the patient, generally speaking, has the best chance of a spontaneous cure, it must of course always be a desideratum to prevent the sac from becoming very large, which would lessen the probability of its cavity becoming entirely filled up with lamellated coagula. Sometimes, however, even when the tumor is of vast size, certain changes happen, by which the mouth of the sac is blocked up, the swelling loses its pulsation, and a cure ensues. But the best plan is always to resist as much as possible the increase of the tumor; and since its enlargement and ultimate rupture are caused by the force of the circulation, one grand principle, whenever we aim at promoting a spontaneous cure, must necessarily consist in lessening the impetus of the circulation.

TREATMENT OF ANEURISMS.

In aneurisms of the aorta, debilitating remedies, abstinence, a milk diet, occasional bleedings, the exhibition of digitalis, and the avoidance of all exertion, have been the means commonly recommended, rather with an expectation of retarding the disease, than of effecting a cure. The facts, however, which modern experience has adduced in favour of the efficacy of a treatment first proposed by Valsalva, are certainly such as to justify a confident belief, that many internal aneurisms, even though large and much advanced, are capable of palliation, reduction, and cure. The cases, published by Pelletan, furnish the most convincing evidence, that vast aneurisms of the aorta, so large as to project through the absorbed part of the ribs and sternum, may sometimes be reduced and cured by Valsalva's method. Together with repeated bleeding, strict quietude, and a very spare diet, Valsalva recommended ice, or compresses wet with a cold lotion of vinegar and water, to be applied to the swelling. By such treatment, Pelletan effected the cure of a subclavian aneurism.† In aneu-

* Sir A. Cooper's Lectures, vol. ii. p. 47.

† See Clinique Chirurgicale, par P. J. Pelletan, tom. i. Mém. sur les Aneurismes Internes. Paris, 1810.

risms of the aorta, bleeding so as to induce fainting, is extremely dangerous:* the blood, therefore, should be taken away slowly, and in little quantities at a time.

The principle, on which external aneurisms are usually cured, consists in preventing the entrance of fresh blood into the aneurismal sac; for when this is accomplished, the blood, already contained in the sac, is gradually absorbed, the sac itself contracts, the whole tumor diminishes, and by degrees, the power of using the limb is restored. The stoppage of the influx of blood into the sac, may sometimes be fulfilled by the skilful application of pressure, particularly while the aneurism is small, and its contents can be made to recede. But, although it may be generally proper to try pressure in the early stage of the disease, it cannot be said that the practice is attended with considerable success. I should suppose, indeed, that it does not answer in more than one case out of thirty; and a certain proportion of the successful instances on record are, no doubt, rather examples of a spontaneous cure. On the whole, I am of opinion, that there is no inducement to make a long trial of pressure in any case of aneurism, and that when the disease is already large, and increasing with rapidity, it is better not to waste time upon the experiment. There can be little doubt, however, that pressure would more frequently cure the disease, if it could be made to operate effectually upon a given point of the artery, before this vessel reaches the aneurismal sac. The plan has many times been attempted, and ingenious compressing instruments devised; but, unfortunately, the large nerve, which usually accompanies every artery of importance, must also be compressed, and the agony which the patient experiences is so great as to compel the surgeon to relinquish the project. Another common cause of failure proceeds from the artery not admitting of being efficiently compressed against a firm surface underneath it: consequently, the circulation through the vessel still goes on, and the adhesive inflammation of its inner coat is not excited. Another plan of applying pressure consists in bandaging, with as much equality as possible, the whole limb inclusive of the swelling. Such is the method to which Genga,† Theden,‡ and Scarpa,§ give the preference. Here it seems as if the aim were rather to lessen the impetus of the circulation

* Hodgson, p. 151.

† *Anatomia Chirurgica*, p. 219.

‡ *Bemerk. und Erfahrung*, 1. Th. Berl. 1778.

§ *Treatise on the Anatomy, Pathology, &c. of Aneurism*, transl. by Wishart, pp. 204. 231. 337, &c.

in the member generally, and promote the coagulation of the blood in the sac, than at once to stop the main flow of this fluid into the cavity of the aneurism; as is done either when the artery is compressed, or tied, above the aneurismal swelling. Whenever pressure is tried, the experiment should be conjoined with a low regimen, venesection, the exhibition of digitalis, and the application of ice, or cold lotions, to the tumor. In this branch of surgery, however, it is highly necessary never to be unmindful of the dangerous consequences of immoderate and long-continued pressure; a subject on which I have offered several cautions in the chapter on mortification.

POPLITEAL ANEURISM.

The surgical methods of cure are only two, viz. compression, and the ligature. As Scarpa has observed, compression is not a mode in which much confidence can be placed, except when the rupture of the artery is owing rather to an external cause, than to disease and ulceration of the arterial coats; when the two opposite parietes of the lacerated artery in the ham admit of being pressed against the inferior and posterior surface of the thigh-bone; and when the degree of pressure, which can be employed, is sufficient to excite deeply in the proper coats of the popliteal artery the adhesive inflammation, by which the artery is finally converted into an impervious ligamentous substance. The combination of these three circumstances is a rare occurrence. For, if we suppose what is seldom the case, that the coats of the artery have not been too much diseased, previously to their giving way, to admit of inflaming and adhering together, there are yet many other difficulties, which prevent the surgeon from applying to the artery that exact and steady degree of pressure, which is requisite for the complete and radical cure of the aneurism in the ham. The compressing force on the aneurismal sac must press down and remove from the artery the concentric coagulated layers of blood, so that the pressure may fall precisely on that portion of the vessel immediately above its rupture. This, says Scarpa, cannot take place except in a case of very recent popliteal aneurism, of small size, where the coagulated blood can be made to descend below the place which we wish to compress. Besides this, it is necessary that the compression should not injure the great sciatic nerve, especially its large tibial branch. This is very difficult to avoid, because the nerve runs on the back of the aneurismal sac, and is superficially situated, immediately below the integuments and

aponeurosis of the ham. Strong pressure on the nerve, also, renders this mode of cure insupportable. Nor can the plan answer, if the breach in the artery be too high up, where the femoral artery passes through the tendon of the triceps, or too low down, under the heads of the great muscles of the calf of the leg, where the vessel divides into tibial arteries. In both these situations, pressure cannot be made to operate effectually in holding the parietes of the artery at the necessary point in close contact. Were the pressure powerful enough to force the artery against the posterior surface of the tibia, when the rent in the artery is low down, the obstruction of the inferior articular and tibial arteries, and gangrene of the leg, would be the inevitable consequences.

Such considerations induced Scarpa to lay down the following practical rules: compression is not advisable when the popliteal aneurism is spontaneous, or not depending upon a wound, or violent stretching of the artery; when the aneurism is of long standing, and of large size; when it occasions acute pain and sympathetic fever; when it produces considerable swelling of the leg and foot, with a diminution of their heat; and when the sac is situated too high or too low in the ham. On the contrary, a trial of compression is proper, when the popliteal aneurism is very small, recent, and produced by a violent stretching of the artery; when it is indolent, soft, and yields to the pressure of the hand; when it is situated exactly in the middle of the cavity of the ham; and when it is not accompanied by swelling, or numbness of the leg and foot. But, however favourable circumstances may seem to a trial of pressure, if it be found to excite severe pain, or swelling and torpor of the leg, it should be immediately given up.*

The operation for the popliteal aneurism consists in suppressing, by means of the ligature, the course of the blood through the popliteal artery, so that the current of blood, which passed by this artery, is conveyed to the leg and foot by the different channels of the lateral anastomosing vessels. The effect, in respect to the primary indication which the surgeon proposes to accomplish, is the same, says Scarpa, whether the artery be tied in the ham, a little above the breach in the vessel; whether the ligature be applied on the inner side of the thigh, or in the middle or at the top of the thigh; that is to say, we intercept the flow of blood through the popliteal artery into the aneurismal sac; and successively obtain the

* Scarpa, transl. by Wishart, pp. 227—231.

obliteration and conversion of the diseased artery into an impervious ligamentous cord.*

We are indebted to Mr. John Hunter† for the greatest improvement ever made in the mode of operating for aneurism, and, more especially, the popliteal aneurism. He saw that much of the ill success of the old method arose from the severe practice of laying open the swelling, and tying the artery in the ham; a situation where it was least likely to admit of the adhesive inflammation, by which the vessel was to be obliterated. He was led, therefore, to try the infinitely better plan of taking up the femoral artery above the middle of the thigh, or at some distance from the point where the vessel perforates the tendon of the triceps muscle, and of then leaving the tumor to be lessened by absorption, instead of laying it open. In short, the operation, as practised by the best modern surgeons, consists in making an incision about two inches and a half in length through the skin and fascia of the thigh, precisely over the course of the artery in its descent within the inner edge of the sartorius muscle. Scarpa recommends us, however, to make the incision in the upper third of the thigh, or a little higher than the situation which Mr. Hunter selected, and his reasons for this alteration appear judicious. First, we thus avoid the necessity of removing the sartorius from its position, or of turning it back, for the purpose of getting at the artery. I have frequently seen the best operators, even professed anatomists, embarrassed by the sartorius being immediately in their way, when they had cut through the integuments and fascia. Secondly, the artery is more superficial a little higher up, than in the place usually chosen. And, thirdly, as being further from the disease, it is more likely to be sound, and in an advantageous state for the effects of the ligature.

It is a point of considerable importance in operations for aneurism to avoid all contusion, disturbance, and unnecessary handling of the part of the artery which we are about to tie; for thus we lessen the chance of the vessel inflaming too violently, and ulcerating, so as to give rise to secondary hemorrhage, which is the chief danger to which the patient is exposed. The organization of the blood-vessels being similar to that of other soft parts, they must be subject, like these other structures, to inflammation, ulceration, and sloughing.

* *Op. cit.* p. 235.

† See *Trans. of a Society for the Improvement of Med. and Chir. Knowledge*, vol. i. art. 9.

They are themselves vascular, and derive their nourishment from vessels (the vasa vasorum) transmitted to them from the parts which are immediately around them. Hence the advantage of separating the part of the artery which we are about to tie, as little as possible from its surrounding connexions. In other words, the ligature should always be applied round an artery, as near as possible to the place in which the vessel lies amongst its natural attachments. For many valuable observations in support of this principle, now universally approved, the profession are indebted to Mr. Abernethy.*

In particular, we should keep this principle constantly in view in our next proceedings. We have divided the skin and fascia, and can feel the artery beating under our fingers. The next object is to divide the cellular membrane, till we can see the sheath of the vessel. We are now not to separate the artery to such an extent from the surrounding parts, as will allow us to put our finger under it, a practice which is a serious infringement of the principle above recommended, and on no account necessary, but we should cautiously make a slight puncture or scratch on each side of the undisturbed, undisplaced artery, and then pass a ligature with an eye-probe, or aneurism-needle, under the vessel, observing not to include the femoral vein, and accompanying branches of the anterior crural nerve. The ligature is next to be firmly tied, one end of the ligature being afterwards cut off close to the knot, and the other left hanging out of the wound, the edges of which are to be immediately brought together with adhesive plaster.

If the operator prefer, however, to tie the artery with a ligature composed of fine dentist's silk, *he may then cut off both ends of it*, close to the knot, and endeavour to heal the wound by the first intention. This method I have seen followed by Mr. Lawrence; and, in another case, in which Mr. Carwardine, of Thaxted, operated, and the practice was tried, the whole wound healed by the first intention, not a particle of pus was formed, and the cicatrix continued sound.†

There have been several variations made in the operation by different surgeons. Thus Scarpa still prefers avoiding to use the ligature in such manner as to divide the inner coats of the vessel, and, in order to prevent this effect, imitates Paré, Heister, and Platner, by interposing between the arte-

* Surgical Works, vol. i.

† Med. Chir. Trans. vol. viii. p. 492.

ry and the ligature a small cylinder of waxed linen. His advice on this point, however, has produced few or no converts to it in this country, where the principles established by Dr. Jones universally prevail. Since the practice of tying arteries with small ligatures came into vogue, and surgeons have taken care not to separate the artery too much from its natural connexions, and not to irritate it with the presence of any extraneous substances, in addition to a single small ligature, the frequency of secondary hemorrhage has been surprisingly lessened, and operations for aneurism attended with the most brilliant success.

In the chapter on hemorrhage, I have adverted to some of the arguments which Scarpa has employed in defence of his precept, that, in tying the artery, we should avoid applying the ligature so as to cut through the inner coats of the vessel, and, therefore, should interpose between it and the noose a roll of linen. In the appendix to his great work on aneurism, he has also introduced an account of some experiments made by Professor Mislei, with a view of ascertaining whether ulceration of an artery is produced more quickly by the noose of a small ligature, or by the noose of a somewhat larger one, with the interposition of a roll of linen between it and the vessel. The tenor of these investigations is to prove, that the simple noose of a fine ligature produces ulceration of the external coat too rapidly, and creates a danger of secondary hemorrhage. Mislei details a case, in which he first tied the carotid of an old emaciated diseased mare, with a single ligature: but four-and-twenty hours afterwards hemorrhage took place. He exposed the artery therefore without delay, and applied a simple circular ligature above the aperture in the vessel, and below it a ligature with the interposition of a cylinder of linen. Thirty-nine hours afterwards, the simple circular noose was removed, and at the end of eighty-seven hours, the other ligature, with the roll of linen, was gently taken away. Twelve days after the removal of the first, the animal perished of hemorrhage from the superior angle of the wound.* This case is considered by Mislei as a complete proof of the superiority of the method of interposing a cylinder of linen between the artery and the ligature. When we carefully read over the particulars, however, we see that the animal, which was the subject of experiment, was in a very unfavourable state for the investigation, being very aged and diseased, with

* See Scarpa's *Memoria sulla Legatura delle Principali Arterie degli Arti*, con una Appendice all' *Opera sull' Aneurisma*, p. 75. Pavia, 1817.

the artery in an ossified condition, highly unpropitious to the access of the requisite healthy kind of adhesive inflammation for the obliteration of the vessel in the situation of the ligature. There was also a good deal of handling, disturbance, and irritation of the vessel, in the different proceedings which were adopted; a cause quite adequate to account for the secondary hemorrhage. I do not, however, attempt to explain why the bleeding happened to come from the part of the artery which had been tied with a simple circular ligature, and not from the other part, which was tied by the interposition of a roll of linen. One part might have been more exposed and irritated, and more detached, than the other, from its natural connexions. At all events, no positive conclusion is to be drawn from one experiment, and that too neither performed on the artery of a human subject, nor on the sound artery of a healthy animal.

On the continent, one or more ligatures of reserve are sometimes put loosely round the artery, above the first ligature with which the vessel is tied. These ligatures of reserve are meant to be tightened, in the event of secondary hemorrhage. But, when it is considered how much the artery must be detached from its surrounding connexions by any super-numerary ligatures, and how likely these extraneous bodies are themselves to cause irritation of the wound, ulceration of the artery, and secondary hemorrhage, the danger of this practice is a very good reason for its rejection. Not one judicious surgeon in this country now remains an advocate for ligatures of reserve.

Cælius, Celsus,* Tenon, and others, mention the plan of tying the artery with two ligatures, and cutting through the intervening portion of the vessel; a practice, which was revived about the same period by Mr. Abernethy, and Professor Maunoir, of Geneva. The former thought this method would leave the artery, as nearly as possible, in the same state in which it is on the surface of a stump; and that secondary hemorrhage from the femoral artery would then not be more frequent after an operation for a popliteal aneurism, than after amputation.† But, as Mr. Hodgson observes, an artery tied in two places, and divided in the interspace, cannot be regarded as placed exactly in the same condition as an artery tied in amputation. In the latter case, the retraction of the vessel corresponds with that of the surrounding parts,

* Lib. v. cap. 26.

† See Abernethy's Surgical Works, vol. i. p. 227, &c.

which are divided at the same instant, and, therefore, its relative connexions stand as before the operation. But, in the operation for aneurism, the retraction of the artery takes place without being attended with a corresponding retraction of its connexions. How far the retraction of the artery is beneficial or injurious, is by no means evident; and if it be supposed useful on the principle of hindering any tension of the artery, this fancied good may be obtained by simply laying the limb in a bent position.* If, then, this method has no particular recommendation, its present decline cannot but be right on the principle of lessening the quantity of extraneous substance in the wound. In fact, few good operators now prefer two ligatures to one. The only circumstance, in which this practice is decidedly advantageous, is where the artery has been too extensively separated from its natural connexions; for then one ligature may be applied at the upper end of such detached portion of the vessel, and the other at the lower; so that they will both lie closely to the points at which the artery begins to be surrounded by its natural connexions again.

Having already declared myself to be no admirer of the practice of compressing the artery between a cylinder of linen and the ligature, I can entertain no favourable opinions of any other analogous modes of operating, as executed with the *presse-artère* of Deschamps, the *serre-nœud* of Desault, or the instrument proposed by Mr. Crampton. Nor do I hesitate to deliver the same judgment, respecting the plans of compressing the artery between two metallic surfaces, as we see exemplified in the use of the pincers of Baron Percy, and Assalini's compressor, represented by Fig. 3. Plate 1.

In the chapter on hemorrhage, I have noticed the expectations which were once raised by the interesting experiments of Dr. Jones, that, if a smallish ligature were tightly applied round an artery, the cord might be immediately afterwards removed, and still the tube of the artery become impervious. Had this hope been realized by later investigations, the surgeon would then have had no extraneous substance in the wound, which would have had a better chance of healing by the first intention, while the risk of secondary hemorrhage from ulceration of the vessel, induced by the ligature, would have been entirely removed; but, unfortunately, the momentary application of a ligature is not found to be always,

* On Diseases of Arteries, p. 222.

or even generally, followed by an obliteration of the tied part of the vessel.

Mr. Travers* conceived, that if the ligature were applied a certain time, and then removed, it might simplify the practice employed by surgeons for obliterating the larger arteries; but, further observation has led him to renounce the plan. Sir A. Cooper in one case tied the femoral artery very firmly, and loosened the ligature after thirty hours; but, in half a minute, the aneurism began to pulsate as strongly as ever again. The ligature was, therefore, tightened for forty-two hours longer, and the pulsation did not return. Thirteen days afterwards, hemorrhage occurred; but it was stopped by the tourniquet, and a cure followed. In a case of radial aneurism, this method failed in hindering the return of pulsation when the ligature was loosened at the end of twenty-four hours, and the common operation was judged advisable.† Scarpa, however, continues an advocate for the removal of the ligature, as soon as the closure of the artery is sufficiently advanced to obviate all chance of its becoming pervious again, and it is strong enough to resist the impetus of the blood. He represents this period to be on the third or fourth day after the operation, when he recommends us to remove the ligature altogether, and not wait for its spontaneous detachment, as its longer continuance, he conceives, is of no further use, and may sometimes cause ulceration at the principal point of adhesion between the sides of the artery.‡ Although I fully agree, that a sufficiently firm closure of the vessel must generally have taken place long before the time when a ligature is spontaneously detached, yet, I apprehend, that if the momentary application of the cord will not suffice, we shall never derive any solid advantage from not awaiting its natural separation. If the ligature could be taken away directly after its first application, then we should be able to close the wound, and attempt to heal it by the first intention, and this with increased chances of success, inasmuch as the case would not be complicated with the presence of any extraneous substance. But, unless the thing can be done in the first instance, we must, in order to be enabled to cut off the ligature, lose all the advantage of the chance of union by the first intention.§

* See Med. Chir. Trans. vol. iv. p. 435, &c.; also vol. vi. pp. 632—643, &c.

† Lectures, vol. ii. p. 55.

‡ See Memoria sulla Legatura delle Principali Arterie, &c. p. 51, &c. &c. Pavia, 1817.

§ See Quarterly Journal of Foreign Medicine and Surgery, vol. i. p. 29. Lond. 1818.

In attempting to remove the ligature, there must also be some danger of tearing the recent adhesion, and thus producing hemorrhage.

When the weather is very cold, or the temperature of the limb sinks after the operation, flannel should be applied. Pressure on the heel is to be prevented, as it is apt to produce a gangrenous spot on it; and perfect rest is to be observed, both while the ligature remains, and for three or four days after its separation, so that the wound may have the best chance of healing by the first intention, and all risk of the newly-closed artery bursting may be avoided.*

OF FEMORAL ANEURISMS SITUATED HIGH UP THE LIMB.

Not many years ago, cases of this description were deemed incurable by any surgical operation, and, perhaps, until the present time, the same opinion might have prevailed, had not Mr. Abernethy† exemplified the possibility, not only of successfully tying the femoral artery above the giving off of the profunda, but even the external iliac artery itself higher than Poupart's ligament, and, as it were, within the abdomen. When we hear, from a register of cases, in which this bold and judicious proceeding has been adopted, that out of twenty-two, fifteen were cured,‡ we must dispel all fear about the limb being left without other adequate channels for the continuance of the circulation. Indeed, the numerous instances, in which the external iliac artery has now been tied, fully warrant the conclusion, that the limb is not in more danger of mortifying after the ligature of this vessel, than after that of the femoral artery below the profunda; and the several opportunities, which I have had of seeing the external iliac tied, have left not a doubt in my own mind, that the success of the operation would have been still greater, had it been done in some cases at an earlier period, before the tumor had become very large, and the health materially impaired by long confinement. No doctrine, I think, is more pernicious than that, which inculcates delay for the unnecessary object of giving the anastomoses time to enlarge; for these are always ready to do their office, if they be not prevented by the effects of the distention and pressure of an enormous tumor. The truth of these remarks was strikingly displayed in the ever-

* See Sir A. Cooper's Lectures, vol. ii. pp. 58, 59.

† Surgical Works, vol. i. p. 227, &c.

‡ Hodgson on the Diseases of Arteries, &c. p. 417.

memorable case of inguinal aneurism, in which the human aorta was tied: for, notwithstanding the ligature of this vessel above its bifurcation, the blood found its way with ease into the limb, which was not on the same side of the body as the disease; but on this side, the same desirable circumstances seem to have been impeded by the obstruction produced by the pressure and effects of the tumor.* In order to take up the external iliac artery, the integuments are to be divided in the direction which this vessel naturally takes in its descent to pass out of the pelvis. In an adult, the incision of the integuments is to begin half an inch below the superior spinous process of the ilium, and an inch and a half from the same process towards the linea alba. From the point here specified, the wound is to be carried down nearly as low as the femoral arch, but not lower, in order to avoid injuring the spermatic cord and epigastric artery. The aponeurosis of the external oblique muscle, at the bottom of the wound, is to be divided to the same extent. The point of the finger is then to be introduced into the lower angle of the incision, and, under its guidance, the layers of the internal oblique and transverse muscles are to be cautiously divided, particular care being taken not to hurt the subjacent peritoneum, which serious accident may be avoided by pressing this membrane a little back with the finger, where it first makes its appearance under the divided aponeurosis of the transverse muscle. The finger will now be in immediate contact with the external iliac artery in the vicinity of the lower angle of the wound, and a little above the origin of the epigastric, at the exact point at which the former vessel rises from the side of the pelvis, to pass over the horizontal ramus of the os pubis,† where it makes another turn to descend under the femoral arch to get to the bend of the thigh. At that point, after the vein has been separated from the artery by means of the end of a director, a single ligature is to be passed with an eye-probe, or aneurism needle, under the artery, and firmly tied. It is observed, that the situation of the latter vessel over the vein, at the point above described, is a circumstance materially facilitating the application of the ligature.‡ In general, however, surgeons tie the external iliac artery rather higher than the point here specified, and the vein then lies on the inner side of it.

* Surgical Essays, by A. Cooper and B. Travers, p. 114, &c.

† Haller, Fasc. Anat. Arteriae Pelvis, Tab. 1, 2. z. b., and Scarpa in Memoria sulla Legatura delle Principali Arterie, &c. p. 116.

‡ Scarpa, p. 117.

ANEURISM AT THE BEND OF THE ARM.

In operating on aneurisms of the brachial artery, former surgeons always deemed it necessary to tie the vessel both above and below the swelling. They thought that one ligature, above it, would not be sufficient, by reason of the freedom with which the blood would get into the sac, through the inosculations between the collateral and recurrent arteries. Scarpa has explained, however, that one ligature, above the tumor, is quite enough. An incision is to be made along the inner edge of the biceps muscle, the sheath of the artery opened, and the vessel, after being separated from the median nerve, and two accompanying veins, tied with due firmness.

When aneurism of the brachial artery is diffused, and attended with violent pain and inflammation, Scarpa* prefers the old operation of opening the tumor, taking out the coagulated blood, and tying the artery with two ligatures, one above, the other below, the opening of the vessel. The same practice is said to be necessary when the aneurism is very large.†

AXILLARY ANEURISMS.

The sufficiency of the anastomosing vessels for the transmission of the blood, when a large arterial trunk is tied, appears now to have been exemplified in every situation, where the performance of such an operation is at all practicable. Not only may the external iliac artery be tied, without the circulation in the lower extremity being cut off, the subclavian artery may also be secured at the point where it first emerges from the chest, and yet the arm receive an adequate supply of blood.

In several operations, where the artery was tied through an incision below the clavicle, a large portion of the great pectoral muscle was divided; indeed, in the case of a wound where it is necessary to apply a ligature both above and below the aperture in the vessel, such proceeding must sometimes be indispensable for the purpose of ascertaining the exact point of injury. But, in an aneurism not extending too

* Anatomy, Pathology, and Surgical Treatment of Aneurism, transl. by Wishart, p. 356.

† Sir A. Cooper's Lectures, vol. ii. p. 80.

far inward, the following less severe method is practicable, though more difficult of execution.

An incision two inches and a half long is to be made through the integuments, a little below the clavicle, and immediately over the hollow between the deltoid and pectoral muscles. The axillary vein here lies in front of the artery, and as a wound of it would probably be fatal, the utmost caution must be observed in the dissection. Care must also be taken not to mistake one of the cervical nerves for the artery. With an eye-probe, a ligature is to be put under the vessel, as soon as it is distinctly ascertained to be such, and the vein and any adjacent nerve should be carefully excluded.

Scarpa describes the method of operating below the clavicle as follows : the patient being seated with the shoulder somewhat depressed, an assistant standing behind is to hold him firmly in this position. The operator is to commence the incision in the integuments an inch from the sternal extremity of the clavicle, and to extend it along the lower edge of this bone towards the acromion, as far as the hollow between the pectoral and deltoid muscles. To the same extent he is then to detach the pectoral muscle from the clavicle, and reflect it a little, when the pectoralis minor will be found presenting itself, which, proceeding from the coracoid process, will be seen intersecting the lower, or external angle of the wound. The surgeon is now to insinuate the end of his finger between the point of the coracoid process, and the lower edge of the clavicle, where he will feel the exposed subclavian artery, surrounded by a part of the brachial plexus of nerves, and the subclavian vein in front of it. The artery having been separated from these parts, is next to be tied.*

When the aneurismal tumor extends far inwards towards the sternum, the only place where the subclavian artery can be taken up, is just where it emerges from the chest, from behind the anterior scalenus muscle, and the object must be effected by cutting above the clavicle. On a dead subject, having no large aneurismal swelling, such an operation is much easier than on a living person, whose clavicle is sometimes pushed up by a vast tumor, so as to render the distance, between the artery and the wound in the skin, considerable.† However, in some cases, no difficulty of this kind was experienced ; a fact, perhaps, to be imputed, either to the particu-

* Memoria sulla Legatura delle Principali Arterie, &c. p. 126. Pavia, 1817. A similar method of finding the subclavian artery was also described in Mr. C. Bell's *Operative Surgery*, vol. ii. p. 370. edit. 1.

† See NOTE Q.

lar position and figure of the tumor ; a natural difference in the distance between the clavicle and first rib in different individuals ; and some variation made in the size and height of the wound, and parts cut, by different operators.* The common plan consists in making an incision about two inches and a half, or three inches in length, along the upper edge of the clavicle, beginning it a little above the clavicular portion of the sterno-cleido-mastoideus. The fibres of the platysma myoides are next to be carefully divided to the same extent, when several veins will generally present themselves, and, if they cannot be pushed aside, and should bleed much on being divided, ought to be tied at once, so that the blood may not obscure the rest of the requisite proceedings. The cervical fascia having been cautiously divided, the knife is to be laid aside ; the cellular membrane and glands of the neck separated with the finger, or end of a director, and the eminence felt for at the junction of the bone with the cartilaginous part of the first rib, the point, where the vessel will be found coming out from behind the anterior scalenus muscle. The ligature is then to be conveyed under it with the aid of one of the needles hereafter described. Care must be taken not to mistake one of the cervical nerves for the artery, the pulsation of which communicates a corresponding motion to any of these nerves in its vicinity. Most of them, however, lie rather behind it, and more towards the shoulder.

This operation has now been done with complete success by Dr. Post, of New York, Mr. Liston, of Edinburgh, Dupuytren, and several other surgeons.

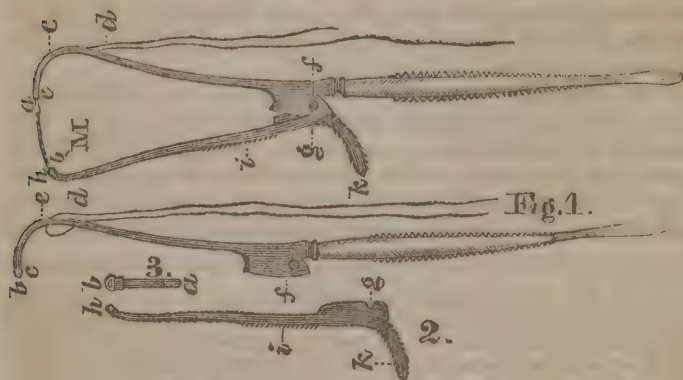
The judgment that I formed from the observation of the first instance, in which this operation was ever finished, was, that, in all probability, a complete cure would have taken place, had the attempt been made earlier, before the tumor began to slough, and before the health was materially impaired ; and had the operation itself been shortened and facilitated

* In the first attempt which I saw made to take up the subclavian artery, it was very deep, and the surgeon tied one of the cervical nerves instead of it. In the next case which fell under my observation, the operation took up nearly an hour, on account of the difficulty of getting the ligature round the artery. Dr. Post, of New-York, whose case is the first instance of recovery after the operation of tying the artery by cutting above the clavicle, found it necessary to use an instrument calculated to facilitate the conveyance of the ligature round the vessel. See *Med. Chir. Trans.* vol. ix. p. 188. In one case, Sir A. Cooper was even prevented by this difficulty from completing the operation. See *Lond. Med. Review*, vol. ii. p. 300. On the other hand, Mr. T. Blizard, and some other surgeons in their particular examples, had no difficulty in applying the ligature with a common aneurism needle. Hodgson, *Op. cit.* p. 598.

by the assistance of the needles represented in Mr. Ramsden's publication.

These instruments undoubtedly resemble, in principle, Desault's spring aneurism needle, which consisted of a silver sheath, one end of which was straight, and the other curved in a semicircular way. This sheath enclosed an elastic wire, one end of which projected a little beyond the bent end of the sheath, and had a transverse eye in it, for the reception of the ligature. The instrument being introduced under the artery, the sheath was kept fixed, while the elastic wire was pushed through it, till the transverse eye had ascended sufficiently to let the surgeon take hold of the ligature. This being disengaged from the instrument, the latter was withdrawn.* The needle, invented by Mr. Watts, appears to me rather an improvement on Desault's, inasmuch as it is made to let loose the eye and ligature together, as soon as they are conveyed far enough round the artery; a contrivance which overcomes the difficulty of extricating the ligature. See Fig. 4, Plate 1.

The most ingenious contrivance, however, for passing a ligature under a deeply-seated artery, where the wound is narrow, is the needle made by Mr. Weiss, at the suggestion of Mr. Kirby, of Dublin. The following is a representation of it, reduced to one half of its proper size.†



* See *Œuvres Chirurgicales de Desault* par Bichat, tom. ii. pp. 560, 561.

† It consists of three parts; the *porte-aiguille*, the disengaging forceps, and the needle. The needle, fig. 3, is short, flat, and elastic, with a wide eye, *a*, and a thick point *b*, that also has an eye in it to be laid hold of with the forceps. The *porte-aiguille*, 1, is hollow from *c* to *e* for the reception of

CAROTID ANEURISM.

That the carotid artery might become gradually obliterated, without any dangerous effect on the brain, and that an aneurism of it might undergo a spontaneous cure, was long since proved by the case related by Petit.* But, besides this kind of obliteration by a process of nature, modern experience has evinced, that the carotid artery may be tied with a ligature, and thus rendered suddenly impervious, without any pernicious consequences on the brain. Hebenstreit mentions a case, where the external carotid was wounded in the extirpation of a tumor; and the patient would quickly have fallen a victim to the hemorrhage, had not the surgeon instantly tied the trunk of the artery. The patient lived many years afterwards. After the battle of Waterloo, I assisted my friend Mr. Collier in taking up the carotid, for the purpose of suppressing a violent hemorrhage from a wound made with a lance, and extending from the angle of the jaw into the mouth. This operation had the most successful result.

Aneurism by anastomosis, situated in the orbit, antrum, and on other parts of the head, have been cured by the application of a ligature to the common carotid. The cases, recorded by Mr. Travers, Mr. Dalrymple, and Professor Patison, of Baltimore, illustrating the success of this practice, are highly deserving of the notice of the profession. In a few instances, the carotid has been tied, for the purpose of lessen-

the needle, and has a slit in it from *e* to *d*, so that the extremity *a* of the needle, when it is in the case, is in the middle of the slit *e d*, and the eye can be threaded. Another essential part of the *porte-aiguille* is the transverse fulcrum at *f*, on which the notch *g* turns. The length of the forceps, 2, must be exactly such, that when the notch is on the fulcrum, the spring at the end, *h*, is correctly applied to the point *b* of the needle in its case. When the instrument is to be prepared for use, the end of the needle, marked *a*, is to be put into the hole, marked *c*, at the end of the *porte-aiguille*, and pushed quite home. One end of the ligature is then to be put through the slit at *d*, from the outside of the needle, and the same end again from the inside through the eye of the needle, and the slit at *e*. The needle thus threaded, is to be introduced under the artery; and now the disengaging forceps, marked 2, is to be placed with its notch *g* on the screw, when by pressing on the rough part of the handle of the forceps, marked *i*, the surgeon will make the point *h* catch hold of the eye *b* of the needle, to which the ligature is attached. Then, by taking hold of the part of the handle of the forceps, marked *k*, and pressing it downwards, he will draw out the spring, and the ligature with it. The best mode of clearing the ligature from the spring, is to cut the former away at both ends from the instrument. See Edinb. Med. Journ. No. 76.

* Acad. R. des Sciences de Paris, an. 1765.

† See his trans. of B. Bell's Surgery, vol. v.

ing the hemorrhage, during the removal of large complicated swellings from the neck and side of the head.

The operation is performed by making an incision through the integuments of the neck, beginning just above the upper part of the sternum, and ascending for two inches, or a little more, by the side of the inner edge of the sterno-cleido-mastoideus. A wound of this length will be quite long enough to expose the sterno-hyoideus and sterno-thyroideus muscles.* The patient's chin being now turned towards the diseased side, in order to relax the sterno-cleido-mastoideus, while the sterno-hyoideus, and sterno-thyroideus are gently pressed towards the trachea, the large internal jugular vein presents itself. This vessel, on account of its magnitude, and its alternate expansion and subsidence with each inspiration and expiration, might sometimes retard the operation, were it not pushed towards the outside of the neck. Immediately under the internal jugular vein, the common carotid appears. The operator is then cautiously to make a small opening, about a quarter of an inch long, in the sheath of the cellular membrane, which includes the artery. He now separates this vessel from the par vagum, and introduces a ligature under it with an eye-probe, or aneurism needle. Sometimes two ligatures have been used, and the vessel divided between them; but, I believe, little doubt is now entertained about the preference, which should be given to the employment of only one, excepting for a wound of the carotid, where two would be indispensable, or where a long portion of the vessel has been detached from its natural connexions.†



CHAPTER XXX.

FRACTURES.

FRACTURES are of two principal kinds, namely, *simple* and *compound*. A *simple* fracture is unattended with any external wound, caused by the protrusion of the end of the broken

* Scarpa, sull' Aneurism. tav. 5. 98.

† The cure of a carotid aneurism, by tying the artery above the swelling, when the ligature could not be applied below it, has been accomplished by Mr. Wardrop. See Med. Chir. Trans. vol. xiii.

bone: a *compound* fracture is always accompanied with a wound of this description.

A fracture is often named *complicated*, when the bone is broken in more places than one, or is joined with dislocation, the injury of some considerable blood-vessel or nerve, a gunshot wound, &c.; and when the bone is crushed, or broken into many small pieces, the fracture is termed *comminuted*.

The expressions *longitudinal*, *transverse*, and *oblique* fractures, signifying their direction, with respect to the axis of the bone, are also frequent in the language of surgery.

The long cylindrical bones are more frequently broken than the short, or flat ones; a fact, explained by their shape, their uses, their situation, and the many powerful muscles attached to them. It is generally stated in surgical books, that the muscles are always concerned in the production of fractures; but this is far from being the case. We know, that they sometimes act with such force, that they break the patella, and even the humerus, without the co-operation of any external violence whatsoever. We know, that when a person is falling, their effort to save him is often surprisingly powerful, and may contribute, with the blow, or shock, to the production of the fracture. But, when a bone is broken by a direct blow, the muscles have no more share in causing the breach of continuity in the bone, than they ever have in occasioning a fracture of the cranium. In the advanced stages of cancer, particular constitutions, and old age, the bones are sometimes so brittle, that they are broken by very moderate degrees of external force, or even the ordinary exertion of the muscles, independently of all violence.

The symptoms of fractures are exceedingly diversified, according to the bones which are broken; and, though many writers set down loss of motion in the injured limb, deformity, swelling, tension, pain, &c. as forming the general diagnosis, it is easily comprehensible by any one acquainted with the structure of the body, that numerous fractures cannot prevent the motion of the part, nor produce any visible deformity. Thus, there may be a fracture, and yet, from the entangling of the fragments, or from a sound bone serving as a support to the broken one, no distortion can be perceived. Many cases are recorded, in which the patients, under these circumstances, were even capable of walking about, for some time after the accident.* Every surgeon also knows, that

* See Gibson's Institutes, vol. i. p. 372; and Dorsey's Elements, vol. i. p. 113.

though at first there may be pain in the situation of a fracture, no swelling and tension, excepting what may happen to arise from extravasation of blood, can take place till inflammation has had time to produce them.

More or less deformity, pain, swelling, and inability to move or use the limb, are also symptoms which may attend dislocations, and various diseases, so that they are never unequivocal proofs of the existence of a fracture.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace with the finger the outlines of the suspected bone, and whenever any unusual pain occurs, or any unnatural irregularity appears, to try whether a grating, or *crepitus*, can be felt, on endeavouring to make one end of the bone rub against the other. When the *os humeri*, or *os femoris*, is the subject of injury, a *crepitus* is generally felt almost as soon as the limb is touched, and in the case of a broken thigh, there is mostly a considerable shortening of the extremity, caused by the action of such muscles as draw the leg and knee towards the pelvis. But, when there are two bones, as in the leg and fore-arm, and only one is broken, the other continues to prevent the limb from being shortened and thrown out of its natural shape, so that a *crepitus* can only be felt by a proper examination with the fingers. As I am aware, that considerable harm, and great unnecessary pain, have frequently been occasioned by the custom of feeling for a *crepitus*, and moving the limb about in all directions in order to produce it, let me observe, that the plan is only justifiable when the nature of the case cannot be sufficiently understood without it. A fracture is a case necessarily attended with considerable injury of the soft parts, and always followed by more or less inflammation, and its usual consequences, heat, tension, swelling, &c.; all unnecessary rough handling of the part, therefore, must be, above all things, contrary to the principles of good surgery.

The displacement, or derangement of a fractured bone, may be either *angular*, *longitudinal*, *transverse*, or in the direction of its circumference, and very frequently more or less in all these directions together. The causes of the displacement always depend, either upon the force by which the accident was produced, upon the action of muscles, upon the weight of the body, or that of the limb itself.*

The muscles of a broken limb are often affected with spasms,

* Gibson's Institutes, vol. i. p. 373.

which put the patient to great pain, and when the thigh-bone, humerus, or both bones of the leg or fore-arm are broken, sometimes occasion, during their violence, very considerable distortion of the member.

The prognosis depends very much upon the injury done at the same time to the soft parts; the patient's age and constitution; the direction of the fracture; and the particular bone broken. Oblique fractures of the long bones are more difficult to cure without deformity, than transverse ones. Compound, complicated, and comminuted fractures, are the most dangerous. A fracture near, or affecting a large joint, frequently ends badly; but injuries of the patella, olecranon, and small joints, mostly have a favourable termination. A fracture of the neck of the thigh-bone, *within the capsular ligament*, perhaps, does not admit of a perfect cure, a bony union never taking place. Fractures of the patella, olecranon, condyles of the os humeri, and coronoid process of the ulna, also generally unite by means of a ligamentous substance.*

The steps of nature, in the union of broken bones, are very similar to those which she pursues in the union of wounds of the soft parts. The vessels on the surfaces of the fracture, and those of the periosteum, and soft parts directly adjoining the injury of the bone, first effuse coagulating lymph. This gradually becomes vascular, and as its vessels acquire the power of depositing earthy matter, it is ultimately converted into new bone, termed *callus*, which becomes the bond of union.

In order that the first connecting substance may speedily become organized, and adapted to the formation of callus, nothing is so favourable as perfect quietude. Hence, the chief surgical indication, after the ends of a fracture are replaced, is to keep them perfectly motionless: nature completes the rest. The accomplishment of a complete bony union, however, requires that each end of the fracture should be duly supplied with blood; and hence the reason may be understood why fractures of the neck of the thigh bone *entirely* within the capsular ligament, and some other cases, do not generally unite by bone. In the example here specified, the only channel for blood to the upper fragment, must be the small vessels of the ligamentum teres. The observations of Sir A. Cooper† likewise tend to prove, that if the end of a fracture be kept much asunder, or with such an interspace as

* See A. Cooper on Dislocations, &c. p. 112. edit. 4.

† On Dislocations, p. 116.

occurs when the protruded end of the tibia is sawn off, and the fibula is whole, no bony union follows. Different bones require different lengths of time to be firmly united ; the ribs and clavicle unite as soon as any ; in general the os brachii is tolerably firm in five weeks ; but, the bones of the leg and the os femoris seldom become perfectly strong in less than six. These calculations, however, refer to adults ; for, in children, fractures are cured with much greater expedition ; and, it is always found, that the quickness of union in all persons, is in proportion to the vascularity of the bone or bones concerned, the skill of the treatment, and the sound state of the constitution.*

The three principal indications in the treatment are, to reduce the ends of the bone if displaced, to retain them in this position, and to administer such diet and medicines as the future symptoms and state of the patient may require.

In the language of surgery, the first indication is accomplished by extension, counter-extension, relaxation of the muscles, and coaptation, or the adjustment of the fragments.

The relaxation of such muscles, as have the power of displacing the ends of a fractured bone, always materially facilitates the reduction. The choice of an advantageous position, indeed, is the first thing in all cases, in which the extremities of the fracture are not in even contact. The muscles are the chief powers which cause the displacement, by drawing that end of the bone which is most moveable, out of its due position, in regard to that which is most fixed. Hence, in the extremities, the lower ends of fractures are those which are truly displaced, being drawn upward, or to one side, by the action of certain muscles, which have their origin and insertions both above and below the situation of the breach of con-

* {On the subject of fractures, Mr. Abernethy, in his lectures as lately published, remarks—"In young children the cohesion of the earthy part of a bone may be broken without the soft parts being torn ; nay, the bones in early life even admit of being bent in some degree. These cases of fractures of the mere earthy part of a bone in childhood, generally puzzle young surgeons. A child having fallen upon the floor with its thigh turned under it, is afterwards unable to walk ; the soft parts gradually swell ; every motion produces pain ; yet the surgeon can detect no disjunction, displacement, nor deformity of the limb ; he is, therefore, apt to regard the case as one of violent sprain or bruise of the soft parts. It is best, however, to treat such an accident, as if it were evidently a fracture, for it is always proper to preserve injured parts in a motionless state ; and when thus treated, all pain ceases, and the swelling rapidly subsides, circumstances which seem to identify the nature of the case." For a particular account of these species of fractures, the student is referred to the paper by Dr. J. R. Barton, published in the *American Medical Recorder* for January, 1821. }

tinuity. The muscles, therefore, which displace the lower ends of such fractures, are the principal powers which must be counteracted. In oblique fractures, it is much more difficult to keep the ends of the bones in a proper state of coaptation, because two oblique surfaces make no mechanical resistance to that effect, (*viz.* the retraction of the lower portion of the broken bone,) which the strong muscles have a continual tendency to produce.

But the relaxation of muscles, possessing the greatest influence over a fracture, is not only to be observed while the surgeon is setting the broken bone; it is to be strictly adopted throughout the whole of the treatment, at least, until the two ends of the bone have become firmly united. Were this plan not rigorously followed, the fracture would soon be displaced again by muscular action.

The principle, from which the utility of relaxing muscles in these cases arises, is the fact, that every muscle can only contract to a certain degree of shortness: and that in proportion as its origin and insertion are approximated, the disposition to spasmodic action diminishes.

The reflecting student may inquire, what particular position will relax every muscle connected with a broken bone? The same position, which relaxes the flexors, seems to have quite an opposite effect on the extensors. The answer is, that no posture will completely relax every set of muscles in every instance; and in this circumstance, the joints must be placed in the middle state, between perfect flexion and perfect extension, as in this manner, though complete relaxation is not effected, most of the muscles will not be in a state of tension. When, however, every muscle, having the power to displace a fracture, can be relaxed, the others, which have no power over the progress of the case, may be neglected, and the posture determined accordingly. Thus, in common fractures of the leg, where we cannot perfectly relax every muscle capable of disturbing the fracture, we place the knee-joint in the mid-state, between perfect flexion and extension: but in a fracture of the patella, where we can relax every muscle capable of resisting the object of the surgeon, we regulate the posture, without any regard to other muscles, which have no influence over the fracture.

In cases of broken thighs, where the impossibility of relaxing every muscle that has the power of disturbing the fracture is strongly exemplified, it was the practice of Mr. Pott to select also a half-bent position of the hip and knee-joints, in which state he conceived that less trouble was experienced from the action of the muscles. It does not require, however,

a powerful mass of muscular fibres to displace the fracture. Hence, though the half-bent posture may relax such muscles as have the greatest force, yet, if we leave a certain set of muscles unrelaxed, which, by their action, can draw the ends of the broken bone into a wrong position, I am afraid, posture alone is not the great object, to which every other consideration should be sacrificed. I am also the more persuaded of the truth of this remark, from knowing, that no position, no approximation of the origin and insertion of a muscle, can altogether prevent those violent, involuntary spasms, which take place in cases of fractures. We must then turn our minds to the improvement of our mechanical means for holding the ends of the broken bone steadily and evenly together. In the case of a broken thigh, it is quite impossible to employ the bent position, as advised by Pott, which relaxes the most powerful and troublesome muscles, and, at the same time, use the best kinds of apparatus for keeping the ends of the fracture in a proper state of coaptation, and free from motion. In this accident, the whole limb ought to be kept motionless by mechanical means; for, if the knee be left unconfined, and the leg subject to frequent motion, as is actually the case in Pott's mode of treatment, how are we to expect that the fracture can remain undisturbed and undisplaced? However, when position of the limb, and relaxation of the most powerful muscles, can be made to concur with the best mechanical apparatus for securing the ends of a broken bone from being displaced, these are the principles by which we should be governed. Hence, in the case of a broken thigh, the position of the limb on the double-inclined plane, with the patient lying on his back, and his leg and foot properly fixed on the machine, is greatly superior to Pott's method of treatment.

The positions for particular fractures, will be noticed in the second part of this work.

Having placed the ends of the fracture as evenly together as the case will allow, the next object is to keep them securely and quietly in this state, until they have become firmly united.

In certain constitutions, almost all the muscles of the injured limb are continually acting in a violent, involuntary, and spasmodic manner, so that neither position, nor mechanical means, are effectual in preventing displacement of the fracture. Patients, in this state, if young and robust, should be bled, and be kept under the influence of opium.

The mechanical contrivances, employed to give that degree of support to the limb, which the breach of continuity

in the bone or bones has taken away, consist of instruments called splints, with which a kind of steady, unyielding case, is formed for the limb. Splints ought to be made of strong material, and of a sufficient length to reach beyond the two joints nearest the fracture, and they ought to be adapted in shape to the contour of the limb. They are generally secured with straps or tapes.

However, as the hardness of splints would give pain, if they were firmly applied to the limb, without the intervention of soft materials, it is customary to place a piece of the emplastrum saponis immediately over a simple fracture, and to apply, what is termed an eighteen-tailed bandage, between which latter and the splints are also interposed pads filled with tow, or any other soft substances. Additional soft compresses are also generally put at every point where the pressure of the splints is likely to give pain.

When there is much swelling, surgeons generally apply, for the first few days, cold water, with a little spirit of wine in it; the liquor ammon. acet., or the lotio liq. plumbi acetatis, instead of a plaster, and the linen, employed for this purpose, may be kept sufficiently wet, (without taking off the splints) by squeezing the water or lotion out of a sponge into the interspaces between them.

All violent extension for the reduction of fractures, is quite abandoned by the moderns. In general, when the muscles are relaxed in a scientific manner, the ends of the bone may be put into a state of coaptation with the greatest ease, and very little extension and counter-extension is necessary. Many fractures, indeed, are not in the least displaced.

Common fractures of the arm and fore-arm, in healthy subjects, are firmly united in about a month; while those of the thigh and leg require about six or seven weeks. When the union does not take place, after a reasonable length of time, the surgeon should endeavour to ascertain the cause. This may sometimes be imputed, either to the ends of the fracture not being in apposition; to the part having been moved and disturbed too much; to the advanced age of the patient; or to a general languor, or some idiosyncrasy of the constitution.

In the first and second of these cases, the bone should be set again, and kept quite motionless. When the patient is very old, the use of splints is to be continued longer than in other cases, and tonic medicines may be prescribed.

When several months elapse, without any union of the fracture, and there is reason to apprehend the formation of an artificial joint, surgical writers join Celsus in recommending the

ends of the broken part to be firmly rubbed against each other, with the view of making them inflame and grow together. On the same principle, some surgeons have allowed their patients, with broken legs, or thighs, confined in splints, to get up and walk about. As soon as the necessary irritation is produced, the limb is to be kept motionless a sufficient length of time.*

If such plans fail, it has been proposed to cut down to the broken part, and rasp or saw off the ends of the bone, and then treat the case like a recent compound fracture. The latter operation was first devised, and practised with success, by Mr. C. White, of Manchester, in an example, in which the humerus could not be united by ordinary methods; and scraping the fracture was successfully performed by the same gentleman for the cure of an old fracture of the tibia.†

I have seen the operation of sawing off the ends of a fractured humerus practised without success, in St. Bartholomew's Hospital. After one operation of this kind, done in France, the patient died on the sixth day.‡

On the other hand, Mr. White's cases are highly favourable to the practice. Mr. Rowlands, of Chester, and other surgeons, have likewise found the operation answer. The latter gentleman performed it on the thigh-bone, by cutting down to the fracture between the rectus and vastus externus muscles, and placing a strong plate of tin under the ends of the bone, when the saw was used. It was found necessary to make a transverse incision through a great part of the vastus, in order to facilitate the removal of the lower end of the fractured part; but, though Mr. Rowlands succeeded in his objects, the case was attended with such difficulties, that he expresses himself to be undecided concerning the propriety of advising the operation to be undertaken by others.§

Dr. Physick's practice consists in making the ends of the bone inflame and suppurate by the introduction of a seton through the fracture, and then applying splints. He thus succeeded in consolidating a disunited humerus. This plan, which is considered milder and safer than turning out the ends of the fracture, and sawing them off, has been followed in London, with various degrees of success, by Mr. Brodie, Mr. C. Bell, Mr. Wardrop, &c.¶

* See White's Cases in Surgery, p. 75.

† See Cases, pp. 69—79.

‡ Richerand's Nosographie Chir. t. iii. p. 39. edit. 2.

§ See Medico-Chir. Trans. vol. ii. p. 47.

¶ In the third vol. of the Eclectic Repertory, Dr. Hartshorn of this city

COMPOUND FRACTURES.

A compound fracture is accompanied with a wound of the integuments, caused by a protrusion of the end of the broken bone.

When the wound is large and lacerated, when the bone or bones are extensively splintered, or shattered, and when the neighbouring muscles are severely injured, the case must be considered as extremely dangerous.

A limb in this condition, submitted to the inspection of the discerning and scientific practitioner, presents to him one of those urgent cases, in which he sees at once the necessity for immediate amputation. The accident is an analogous injury to a bad gun-shot wound of the limb, with fracture, and the observations which have been made respecting the frequent danger of delaying the amputation of limbs, shattered by gun-shot violence, are in every respect applicable to these very bad compound fractures, occasioned by other causes.

So great and considerable an injury, inflicted upon parts endued with life and sensibility, capable of inflammation, supuration, and gangrene, cannot be expected to take place, without being followed by the most severe effects, both upon the limb itself and the constitution. Supposing, however, the bone to be less badly broken, and the soft parts not quite so much bruised, wounded, and torn, and no large artery lacerated, the case is then of a very different description; and resorting to amputation, without an endeavour to save the limb, would be rash and unjustifiable. Instead of this, the fracture is to be immediately placed as nearly in its natural situation as circumstances will allow, and the wounded integuments brought nicely into contact by means of adhesive plaster, in order that the chances of union by the first intention may be taken. Under favourable circumstances of constitution, and

has given two cases cured by caustic issues over the place of fracture, one in 1805, the other in 1811. In the first case, a simple fracture of the condyle of the femur, the fragments became firmly united twenty days after applying the caustic. The second case, a fracture of the os humeri, in addition to the caustic issue, "the splints were applied to the fracture so as to make firm compression;" three months afterwards, "an obscure degree of motion could still be observed by a careful examination;" after this period he was able to perform the most laborious part of a sailor's duty. The method recommended by Mr. Amesbury, of London, of making firm but properly regulated pressure over the artificial joint, has been found very successful, after other plans have failed. }

proper antiphlogistic treatment, the subsequent local inflammation will not be too extensive and high, to prevent the much desired object of a quick and complete closure of the external wound by adhesion, and when this is the case, the sympathetic fever is always moderate in proportion.

In all cases of compound fractures, in which an attempt is to be made to save the limb, the primary object to be aimed at, is to lessen the danger of the accident, by converting the injury as speedily as possible, from the state of a compound into that of a simple fracture, by uniting the wound of the integuments. Sometimes the plan succeeds, and a very important step is gained. In some instances, only a partial union follows; while, in others, where the contusion and laceration of the soft parts are more severe, the attempt fails altogether.

When the local violence is followed by higher inflammation, when the wound does not unite by the first intention, and suppuration is the consequence, a considerable degree of sympathetic fever generally follows, and great powers of constitution are necessary to bear all the irritation consequent to the injury, and the long and copious discharge. Sometimes, in this state, the constitution, impaired and weakened by the local disease, is attacked by hectic symptoms; fresh irritation occurs about the fracture; large suppurations take place under the fascia, and require to be opened; and the patient is at length brought to the lowest condition of weakness, from which nothing can extricate him, but the removal of the limb, the result of which operation is also uncertain. At other times, the patient's constitution holding out, the suppuration is soon accompanied with the formation of granulations, and cicatrization follows.

Let us consider a third case, in which the violence done to the limb has been more severe, so as to be followed by a speedy mortification of the whole extremity, and death of the patient. Here, perhaps, had the limb been sacrificed, and amputation performed immediately after the receipt of the accident, the patient's life might have been preserved. But, as soon as the rapid symptoms of gangrene have made their appearance, amputation is generally too late; and though it may be a question, whether we ought not in some of these cases yet to amputate, on the principles explained in the chapter on mortification, the inferior chance of recovery, which the patient now has, is proved by manifold experience. Hence, the absolute necessity of determining *primâ facie* the propriety or impropriety of attempting to preserve a limb with

a compound fracture. In cases of compound fractures, there are two points of time when the surgeon has it best in his power to decide, whether it is most advisable to try to preserve the limb, or to sacrifice it for the sake of the patient's life. The one is immediately after the occurrence of the accident, and before an inflammatory and gangrenous tendency in the limb has had time to form. The other is after the subsidence of the first inflammatory symptoms, consequent to the injury, when the constitution seems incapable of bearing any longer the great irritation and immense discharge from the wound, and when hectic fever is more likely to close the patient's existence, if a further perseverance in an attempt to save the limb be made, than that the object in view should be accomplished.

The treatment of a compound is similar to that of a simple fracture, only a more rigorous attention to quietude, diet, and the administration of proper medicines, is necessary. The posture of the limb must generally be regulated by the same considerations as in the case of a simple fracture; the fracture, if displaced, must be reduced as speedily as possible; the limb must be laid upon a splint, long enough to hinder all motions of the two nearest joints, and having upon it a pad of tow or other soft materials, and an eighteen-tailed bandage. The wound must then be gently closed, so as to give it an opportunity of uniting by the first intention. When the wound suppurates, such dressings must be used as circumstances require, care being taken, that, at each application of them, the fracture be disturbed as little as possible. Exfoliations are common in these cases, and attention will be required to the extrication of every piece of bone as soon as it is loose.

Though in the early stage of compound fractures one might generally be induced to have recourse to phlebotomy, as one of the best means for preventing inflammation, it is found in London to be ultimately prejudicial, weakening the constitution too much, and incapacitating the patient to bear the long and copious discharge of matter which often ensues. It is also a commonly received opinion, that compound fractures go on so much better in the country than in this large metropolis, and patients bear so much better the rigorous employment of antiphlogistic measures, that it is right to attempt the preservation of numerous limbs out of town, which in London would require amputation.

In all bad fractures of the lower extremity, it is a matter of great importance to place the patient upon a bed constructed on the principles of that invented by Mr. Earle, by which

means any posture of the whole body or limb, deemed advantageous, may be conveniently maintained, and, what is of equal consequence, the bowels emptied, without the least disturbance of the fracture.



CHAPTER XXXI.

DISLOCATIONS.

WHEN the head, or articular surface of a bone is thrown out of its proper place, with respect to the corresponding articular cavity, or surface of another bone, in or upon which it is naturally situated, the accident is termed a *dislocation*, or *luxation*.

Dislocations are divided, like fractures, into two principal kinds; viz. *simple* and *compound*: simple, when there is no external wound penetrating the capsular ligament, and communicating with the cavity of the joint; compound, when the injury is attended with a wound of this description. Dislocations have also been divided into *ancient* and *recent*; *complete* and *incomplete*; *primitive* and *consecutive*.

Such joints as admit of extensive and various motions, are generally the most liable to dislocations; for instance, the shoulder, which is dislocated more frequently than any other joint. In those of the ginglymoid kind, which move only in two directions, luxations happen much less frequently, and for the most part, are incomplete; that is to say, the articular surfaces, though displaced, are not wholly separated, owing to their great breadth, their mutually corresponding eminences and depressions, and the number and strength of the ligaments by which they are bound together. If we put out of consideration partial dislocations of the astragalus from the os naviculare, we scarcely ever meet with *incomplete* luxations, except in ginglymoid joints, like the ankle, the knee, and the elbow.

Thus, a case is related by Sir Astley Cooper, in which the end of the tibia rested in part upon the astragalus, but a larger portion of it on the os naviculare.*

* On Dislocations, &c. p. 17. ed. 4.

The distinctions *primitive* and *consecutive*, much adopted by Desault, are highly necessary in considering the nature of dislocations ; for, the practitioner should understand well, that after the head of a bone has slipped out of the articular cavity, its situation may be materially altered by the action of the muscles. When it remains in the place into which it was originally forced, the luxation is called *primitive* ; *consecutive* when it has been drawn by the muscles out of the situation into which it was first thrown.

The diagnostic marks of dislocations chiefly consist of circumstances, arising from the functions of the affected joint being interrupted ; and the lodgment of the head of the bone in an unnatural situation, and among parts which it compresses and renders painful. Hence, there is a diminution or loss of motion in the joint ; the limb or part is either shortened, lengthened, or distorted to one side, according to the kind of dislocation ; its axis is changed ; the shape of the joint is altered ; the natural prominences of bone either disappear or become less conspicuous, as the trochanter at the hip ; or the reverse may occur, as in dislocations of the shoulder, where the acromion projects more than usual.* In many cases, the head of the bone may be plainly felt in its new situation, and the nature of the accident readily detected by rotating the limb, as the head of the bone then also rotates.† The pressure of the head of the bone on the surrounding parts causes great pain, which is immensely increased when the surgeon moves the limb in order to examine the case ; extreme agony, and an obstinate and even incurable paralysis being induced, when a large nerve is thus compressed and injured. Nay, the pressure of the head of a dislocated bone upon important organs, may endanger life ; and Sir A. Cooper has recorded one instance, where such danger arose from the pressure of the sternal end of the clavicle upon the œsophagus. In thin subjects, before inflammation and swelling have had time to come on, the head of the dislocated bone may sometimes be distinctly felt, forming a preternatural tumor or projection, while, in the situation of the articular cavity, there is an unusual depression, or want of fulness. A considerable degree of mobility sometimes continues for a short time. A man dislocated the head of the thigh-bone upon the obturator foramen ; the thigh could at first be moved about with freedom ;

* Surgical Essays, part i. p. 4. 8vo. London, 1818.

† See Sir A. Cooper on Dislocations, p. 5. ed. 4.

but, in less than three hours, the head of the bone became firmly fixed in its new situation, by the contraction of the muscles.*

A good deal of swelling generally follows a dislocation, and this sometimes very quickly, especially, when the violence has been considerable, and blood is extravasated. However, in simple dislocations, which have been reduced, the ensuing inflammation rarely ends in suppuration; though two fatal instances of it, after the reduction of a dislocated hip, are mentioned by Sir A. Cooper.

Dislocations may be accompanied with fracture: in those of the ankle, the fibula is mostly broken; at the hip, the acetabulum may be fractured; and in the elbow, the coronoid process of the ulna sometimes suffers.

Luxations are mostly produced by external violence, by which such ligaments are torn as naturally keep the dislocated heads of the bones from being thrown into the particular directions in which, in the various cases, they are found to be situated. Even tendons, in the vicinity of the joints, are frequently lacerated. According to Sir A. Cooper, the capsular ligament is torn to a great extent transversely; in the hip, the ligamentum teres is ruptured; but, in the shoulder, he never found the tendon of the biceps broken. He describes the tendons, which cover the ligaments, as being also torn, particularly the tendon of the subscapularis muscle, when the head of the humerus is thrown into the axilla. Some of the muscles are much shortened, while others are upon the stretch, as is the case with the psoas and iliacus internus in dislocations of the thigh-bone downwards. A considerable laceration of muscles now and then occurs, as of the pectineus and adductor brevis, in the latter kind of luxation.†

In the ginglymoid articulations, external violence alone commonly produces luxations, which are frequently incomplete. But, in the orbicular joints, the action of the muscles has a share in occasioning the accident, which is almost always complete. A dislocation of the lower jaw is caused entirely by the action of the muscles, and rarely by mechanical force.

The predisposing causes of dislocations are either natural, or accidental. The natural are, the joint admitting of great latitude of motion; the small extent of surfaces, by which

* Op. cit. p. 3.

† A. Cooper, in *Surgical Essays*, pp. 5 and 6; also on *Dislocations*, &c. p. 7. ed. 4.

the bones touch each other ; the laxity* and small number of the ligaments uniting them ; the shallowness of the articular cavity, &c. The accidental predisposing causes are, paralysis of such muscles as tend to strengthen the joint ; a looseness of the ligaments from disease ; and the circumstance of the bone having been dislocated on one or more previous occasions ; a state, that has a remarkable effect in facilitating the displacement in luxations of the shoulder, patella, lower jaw, and thumb. Boyer mentions a case, where the deltoid muscle being paralytic, the mere weight of the arm dislocated the humerus from the scapula ; and the same writer adverts to a woman, who could not yawn even moderately, without her jaw being luxated, in consequence of a looseness of the ligaments.† If muscles are kept extended for a long time, and their tone is destroyed, or if from a paralytic affection, they lose their action, the bone to which they are attached may be easily dislocated, and as easily replaced.‡ Dislocations are less frequent in very young and elderly persons, than in those of middle age ; because, in old subjects, the ends of the bones are so softened, that the force applied often breaks them ; and, in children, the bones more commonly break, or the epiphyses give way.§ I have attended, however, several cases of dislocation in young children ; and an instance last year (1825) in one of Dr. Good's grand-daughters, whose ulna was dislocated backward at the elbow, though she could not be more than six years of age.

In luxations, the degree of danger is very much altered by the case being simple or compound. Simple dislocations, when recent, may commonly be reduced with facility, and cannot generally be reckoned dangerous. On the other hand, compound dislocations of large joints, like compound fractures, are frequently attended with considerable danger ; and the same nicety of judgment is requisite in determining whether amputation ought to be immediately performed, or an effort made to preserve the limb, as in these latter cases. Hence, most of the remarks, delivered on this point with respect to compound fractures, are here quite applicable. The degree

* A young girl brought up to tumbling, who went to consult Sir A. Cooper, used to have the patella laid flat upon the side of the external condyle of the femur, by the action of the rectus muscle, in consequence of the lax state of the ligaments.

† See Boyer's Lectures on the Bones, by Richerand, transl. by Farrell, vol. ii. pp. 38, 39.

‡ A. Cooper's Surgical Essays, p. 10.

§ See A. Cooper, on Dislocations, p. 19.

of violence and laceration done to the soft parts, the great or little chance of healing the wound by the first intention, the patient's state of health, and his youth or advanced age, are circumstances, by which the judgment should be guided in this difficult part of surgery. In the country, it is said, many cases recover, which in large cities would require amputation.

Dislocations of orbicular, are reckoned less dangerous, than those of ginglymoid joints. In the former, the action of the muscles has a great share in producing the accident, and the soft parts are generally less injured. But, even in joints of the same kind, the extent of the evil is measured by the largeness of the articular surfaces, and the number and strength of the muscles and ligaments. Hence, luxations of the elbow and wrist are generally less hazardous than those of the knee and ankle, the production of which requires the operation of greater violence.

Though luxations of orbicular joints are generally not so dangerous as those of ginglymoid articulations, they are more difficult to reduce, because the muscles, resisting the aim of the surgeon, are more numerous and powerful.

The indications, in the treatment of dislocations, are, to reduce the displaced articular surfaces as speedily as possible, and to support the joint with bandages, or splints, until the lacerated ligaments, tendons, &c. have had an opportunity of uniting: proper means being taken to subdue inflammation, and to prevent as much as possible the incurable stiffness that would arise from an exclusive regard to the second indication.

In some joints, the form of the bone may produce an impediment to the reduction: thus when the socket is surrounded by a ridge, as the acetabulum is, the head of the bone is stopped by it, and requires to be lifted over it. When the head of a bone is larger than its cervix, as is the case with the upper head of the radius, some trouble is experienced.*

The chief difficulty, however, in the reduction of dislocations, arises from the resistance which the muscles make, and which increases in proportion to the length of time the bone remains unreduced. In some cases, this seems to depend in a great measure upon the permanent shortening of the muscles, which will not readily admit of being extended again to their usual length. When a bone is dislocated, the muscles draw it as far from the joint as the surrounding parts will allow, and

* A. Cooper, on Dislocations, &c. p. 20.

by their contraction fix it there. The business of the surgeon is to counteract this resistance. If extension be made immediately after the accident, the resistance of the muscles is easily overcome; but, if the operation be deferred only a few days, the utmost difficulty is experienced. That the action of the muscles forms the principal impediment to reduction, is proved, first, by the facility of putting the bone into its right place in cases where the muscles are paralytic; secondly, by the same facility which occurs when the patient happens to be debilitated by intoxication, or faintness. Thus, Sir A. Cooper mentions a case of injury of the jejunum, and dislocation of the hip, where the muscles scarcely made any opposition to the reduction. Another fact, proving the power of the muscles in making resistance, is the ease, with which a luxation may often be reduced when the surgeon suddenly makes the attempt when the patient's mind is directed to another subject, and the muscles are therefore unprepared for resistance.

These facts furnish useful suggestions in practice, teaching us not only how to avail ourselves of any accidental swooning, or syncope, to replace the bones, but also how to adopt means for the express purpose of inducing faintness, great momentary debility, and universal muscular relaxation. These means are bleeding from a large orifice, nauseating doses of tartarized antimony,* the warm bath, opium, &c. with the aid of which dislocations may be reduced at a later period, than could otherwise be accomplished.† In strong, athletic subjects, the utility of such practice is daily seen; and if there remained any doubt about it, the manner in which it has been lately recommended by Sir A. Cooper ought to produce conviction. In fact, the cases published by him, completely prove, that when this method is neglected, the most powerful mechanical means sometimes fail. One excellent principle in the employment of mechanical force is to begin with it gently, continue it unremittingly, and increase it very gradually. The propriety of attending to this principle depends upon the fact, that the muscles are more certainly overcome by long-continued, gradual extension, than by short, interrupted, numerous repeated exertions of great sudden violence. When the muscles are opposed in this last injudicious manner, it requires an immense time to fatigue them effectually, and the

* A. Cooper, *Surgical Essays*, p. 22.

† A. Cooper, on *Dislocations*, p. 26.

sudden violence is more likely to tear the flesh, than reduce the bone.

In reducing dislocations, counter-extension is to be made; that is to say, the bone, with which the luxated one is naturally articulated, is to be fixed, and kept back while the extension is practised. The necessity of fixing the scapula and clavicle in dislocations of the humerus, and the pelvis in luxations at the hip, is too obvious to require any comment. In making counter-extension, however, one essential caution is requisite; viz. never to make pressure exactly on the articular cavity, or any point between it and the head of the bone, as thus a great obstacle to the reduction would be created.

The extending force may be made either with towels, sheets, &c. put round the limb, and pulled by a sufficient number of assistants, or with what is better, multiplied pulleys, which, indeed, in cases of difficulty, are indispensable. The French (as I think) rightly prefer applying the extending force as far as they can from the luxated head of the bone; but, in this country, the plan of applying the towels, pulleys, &c. to the lower end of the dislocated bone itself, is mostly practised. In luxations of the hip, Sir A. Cooper applies the extension just above the condyles of the femur; in dislocations of the shoulder, however, he makes extension at the wrist, placing the heel in the axilla, and drawing the limb in a line with the side of the body; in which position, the pectoral and latissimus dorsi muscles are relaxed.*

In the reduction, it is always necessary to consider what muscles have the power of opposing the attempt, and, if possible, they should be relaxed when the extension is made.

The return of the head of the bone into its right place, is indicated by a snap heard at the instant of its slipping into the socket; by the restoration of the proper shape of the joint; and by that of its original motion.

The position in which the limb ought to be placed, and kept quiet, until the ligaments have united, must generally be determined on the same principles as in cases of fractures; and sometimes by a knowledge of those positions, in which the part can never be luxated. Thus, the hip can never be dislocated, while the knees are confined together; nor the jaw, while the mouth is shut; hence, the usefulness of bandages, which maintain these positions. In general, however, the reduced bone may be more easily kept in its proper situation, than a bone that is fractured. Some trouble, however, is oc-

* Surgical Essays, vol. i. p. 25; also on Dislocations, &c. p. 28. ed. 4.

casionally experienced, when the bone has been repeatedly out of its place, and the muscles are paralytic, or the ligaments preternaturally loose.

The modes of reducing particular luxations will be noticed in the second part of this work.

In compound dislocations, it is a most important point to obtain a prompt union of the wound, as the injury is thus at once converted into a simple case. Therefore, as soon as the bones are reduced, the lips of the wound are to be accurately brought together with sticking plaster, and the joint kept perfectly quiet in splints.

In compound dislocations of the ankle, it appears to me generally bad practice to saw off the protruded end of the bone. Mr. Gooch was inclined to think favourably of the plan, when the head of the bone had been long exposed to the air.* But no surgeons, of the present day, ever delay the reduction until the bone has been materially affected by exposure. An eminent surgeon in London, who sometimes follows the practice, assigns as a reason for it, the avoidance of tetanus; but this ground cannot be sufficient, because, though the method was never adopted in St. Bartholomew's Hospital, during the many years that I attended it, tetanus was a very rare occurrence there after compound dislocations. It is admitted, however, that if the dislocation can be easily reduced without the use of the saw; if the end of the bone be not so obliquely broken, that it will not remain firmly on the astragalus; if it be not shattered, and the patient so irritable, that the muscles are thrown into violent spasms by the attempts at reduction; the bones ought to be at once returned into their places.† The late Mr. Hey also sometimes sawed off the end of the bone; but, the only instance of the practice published by him, is strongly against it; the patient, after the cure, being able to walk but slowly and weakly, with his toes turned outwards.‡ This gentleman's use of sutures is also to be condemned.

Old luxations can hardly ever be reduced; for, not only the muscles become permanently shortened, and the articular cavity more or less obliterated, but the head of the dislocated bone acquires adhesions to the parts in its new situation, and is sometimes confined by a new bony socket, which must be broken, ere it could change its situation again. Sir A.

* Cases in Surgery, p. 103. edit. 1.

† Sir A. Cooper, on Dislocations, p. 281. ed. 4.

‡ Pract. Observations in Surgery, p. 375. edit. 2.

Cooper considers all attempts to reduce the shoulder, after it has been out three months, imprudent, on account of the injury likely to result from the force employed. The endeavour to reduce the hip, he does not recommend after eight weeks. These rules, however, he does not apply to persons of relaxed fibre, or advanced age.*

Though dislocations are commonly occasioned by external force, they are, now and then, the consequence of disease in the joints. Every surgeon knows, that a luxation of the thigh-bone is often caused, in disease of the hip, by the destruction of the acetabulum, and articular ligaments. Sometimes the ligaments become greatly relaxed, after an accumulation of synovia in the joints. When the knee-joint has been distended with such fluid, the patella is sometimes dislocated by the common efforts of the muscles in walking, as soon as the redundant secretion is absorbed.† We do not often see a dislocation take place in white swellings of the knee; but it may occur. Mr. Lawrence informed me of a child, whose bones of the leg were drawn considerably upwards towards the tuberosity of the ischium, in consequence of disease in the knee; and since this observation was communicated to me, I have met with two or three examples of the same kind. In the museum of St. Thomas's Hospital, is a preparation, in which a knee is dislocated in consequence of the destruction of the ligaments by ulceration: the bones of the leg are ankylosed at right angles with the femur, and turned directly forwards.‡

I once saw, with the above gentleman and Mr. Langstaff, a person afflicted with a diseased knee, whose leg could be bent to a very great extent towards each side, and this even when the limb was brought completely forward.

The pressure of the dislocated head of a bone sometimes gives rise to œdema and paralysis of the limb. Desault met with several dislocations of the shoulder, in which a palsy of the arm was occasioned by injury of the axillary plexus of nerves. Some of these paralytic affections proved incurable; others yielded to the application of the moxa above the clavicle, or to the employment of strong ammoniacal liniments.§

* Surgical Essays, vol. i. p. 21, and Treatise, &c. p. 30.

† See Sir A. Cooper, in Surgical Essays, p. 9.

‡ Op. cit. p. 11.

§ See Œuvres Chir. de Desault, tom. i. pp. 356—357.

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY.

PART II.
PARTICULAR SURGICAL SUBJECTS.

CHAPTER I.

INJURIES OF THE HEAD,

MAY be divided into superficial injuries ; fractures of the cranium ; pressure on the brain from extravasation ; pressure on the brain from matter ; concussion ; phrenitis ; the operation of trepanning.

SUPERFICIAL INJURIES.

Contusions of the scalp, sometimes occasion abscesses under the aponeurosis of the occipito-frontalis muscle. The matter ought to be discharged as soon as its presence is ascertained ; and, if possible, the opening should be made in a depending situation. The same kind of violence may produce an extravasation of blood beneath the same aponeurosis, attended with a tumor, which communicates to the fingers a sensation so like that of a fracture, with depression of the cranium, as may be easily mistaken. The effused blood, however, is soon absorbed, when mild purgatives, and the lotion of vinegar and muriate of ammonia, are duly employed.

Cuts of the integuments of the head, without injury of the skull, are simple wounds, unattended with any peculiarity,

and generally admitting of direct union. Many contused and lacerated wounds of the scalp may also be united. The flaps, angles, and detached portions of these wounds, provided they are connected with the rest of the scalp at some point or other, ought never to be removed so as to cause an unnecessary exposure of the cranium; on the contrary, they ought to be carefully laid down, and, when not too severely contused, they will be found to live and unite to the surrounding parts.

No wounds are more liable to be followed by erysipelas than those of the head; a circumstance explained by Pétit, Desault, and Bichat, by the supposition, that they often disorder the hepatic functions, and thus produce a state of the constitution favourable to its occurrence. It is on the same principle, that these celebrated men, as well as Baron Larrey,* account for the frequency of abscesses in the livers of persons who die after injuries of the head; a thing which Richerand refers to the liver itself generally having suffered a concussion or mechanical injury at the same time as the brain.† But, whatever may be the cause, the facts remain incontestable, that the head is particularly liable to erysipelas from wounds, and that disorder of the liver, and even abscesses in this organ, are occasional complications of injuries of the head. When a tumor is removed from the scalp, however skilfully the operation be done, a severe attack of erysipelas, sometimes ending fatally, will sometimes follow.

Erysipelas, in cases of wounds of the scalp, has been erroneously imputed to an injury of the aponeurosis of the occipito-frontalis muscle and pericranium; and extensive incisions, down to the skull, have been advised, for the purpose of removing the supposed tension of that tendinous expansion. It would be presumption to say, that there never is a case which may be thus benefited: but, I am of opinion, that the practice has been too extensively recommended, the affection being mostly on the outside of the fascia. The best treatment, as far as I have observed, consists in prescribing small doses of tartarized antimony, the blue pill, mild purgatives, and a low regimen.

FRACTURES OF THE CRANIUM.

When the breach of continuity in the bone is very fine, it is termed a *fissure*; when wide and open, it is named a *frac-*

* Mém. de Chir. Militaire, t. iv. p. 213.

† Nosographie Chir. t. ii. p. 245. edit. 4. 1815.

ture. When it happens at some distance from the spot on which the external violence has immediately operated, it is denominated a *counter-fissure*. The skull, at the fractured part, either continues on a level with the rest of the cranium, or it is depressed. The inner table is sometimes broken, while the external one remains entire.

Fractures of the cranium are in themselves by no means dangerous ; that is to say, the simple breach of continuity in the bone, were it unaccompanied with other mischief, would rarely give rise to any serious complaints. In fact, fractures of the skull often get well without any bad symptoms whatever. The alarming symptoms, which frequently originate, are occasioned, either by the bone being beaten inward, so as to press upon or even wound the brain ; or by the sharp irregular edges of the fracture irritating the dura mater, and making it inflame and suppurate ; or else by mischief done to the parts within the cranium by the same force which broke the bone itself.

A fracture of the cranium, without depression, is not only itself unproductive of any dangerous effects, it is also unattended with any particular symptoms.* Its existence can only be ascertained by the eye or the touch, and therefore its diagnosis is not easy, unless it be exposed. However, a surgeon need not be solicitous to find out an undepressed fracture ; nor is he warranted in making an useless incision merely to see the crack ; for, if symptoms demand the application of the trephine, he is to apply it to the bone, whether it be fractured or not ; and if they do not require the operation, the fracture itself can never be a reason for the practice.

Bleeding from the nose, mouth, and ears, are no signs of a fracture of the cranium. The only inference from them is, that the force applied to the head has been violent ; and even this conclusion is not a certain one ; for, some persons have hemorrhages of this sort from very slight causes. Vertigo, paralysis, vomiting, loss of sense, &c. so often attending these cases, denote injury of the brain, and not a fracture of the skull.

* In Klein's *Chirurgische Bemerkungen*, p. 161, we find a remarkable proof of the truth of this observation : a man's skull was so badly broken, that after death, the left half of it could, with very little trouble, have been separated from the right ; yet after the patient had recovered from the first stunning, which lasted an hour, he remained four-and-twenty hours absolutely without any bad symptom.

Though a mere breach in the skull itself is not a source of danger, yet, considered as a symptom, it is of the highest importance; for, it shows that considerable violence has been applied; and, consequently, that the brain may have been injured. The effects on the parts within the skull, however, are not caused by the fracture, but by the same force which produced the breach of continuity in the bone.

Although the internal mischief is mostly situated beneath the place where the external violence has operated with most force, that is, beneath the fracture, yet it not unfrequently lies in a remote part. The same violence which breaks the cranium, may occasion a concussion of the brain, extravasation of blood in, or upon it, and a subsequent inflammation of it.

Even fractures, with considerable depression, are sometimes unattended with urgent symptoms; and, in this circumstance, the trephine is quite unnecessary; for, the only sound reason which can ever be given for its use, is the removal of such pressure from the brain as gives rise to *existing* symptoms of a dangerous tendency.

But whenever these symptoms do accompany a depressed fracture, the sooner the bone is elevated the better. Sometimes the inner table is depressed, so as to wound the dura mater and brain, and cause perilous symptoms, while the outer table is not even broken, nor thrown out of its natural level. On the 19th of June, 1815, I trephined a soldier for such an injury, which he had received at Waterloo. He was lying quite senseless, with stertorous respiration, dilated pupils, &c. On dividing the scalp, he betrayed no signs of sensation; but no sooner had the depressed portion of bone been removed, than he raised himself up, looked round, and began to answer every question put to him.

The only treatment, which a fracture of the skull necessarily requires, consists in taking measures to prevent inflammation of the brain, which is sometimes caused by the mechanical irritation of the fracture, but, in most instances, by the same violence which broke the bone itself. If we could ascertain, that the inequalities or pressure of the fracture caused the bad symptoms, we should be warranted in removing the fractured part with a trephine; but all that we can rationally do in common cases, is to apply cold washes to the part, bleed the patient freely and repeatedly from the temporal artery and arm, and prescribe antimonials, saline purgative medicines, and a low diet. The antiphlogistic regimen should be continued at least a month; for it is by no means uncommon for inflammation and abscesses of the brain to follow in

juries of the head, a very considerable time after the patients have had reason to suppose themselves in perfect safety.*

PRESSURE ON THE BRAIN FROM EXTRAVASATION.

External violence, applied to the head, frequently occasions a rupture of the spinous, or some other artery of the dura mater; and a large quantity of blood is effused on the surface of this membrane. In many instances, the blood is extravasated between the dura and pia mater, or in the very substance, or cavities of the brain. Extravasations between the dura mater and any part of the base of the skull, are mostly fatal.† When the blood lies between the dura mater and tunica arachnoides, or in the convolutions of the brain, it is in general widely diffused; but, when it is situated in the ventricles, or substance of the brain, it is always circumscribed.‡

In cases of extravasation, the patient is usually stunned by a blow, from which state he sometimes soon recovers; while, in other instances, he remains stupid and senseless. When he regains his senses soon after the first effects of the violence have subsided, and afterwards gradually relapses into a drowsy condition, and then into a state which I am about to describe, considerable light is thrown upon the case by there having been an interval of sense. That the following symptoms cannot arise from the concussion, is proved by the patient having recovered his senses, which he at first lost by being stunned; that the symptoms cannot be imputed to a depression of any part of the skull, is clear, because the patient would have continued senseless from the first; that the same symptoms cannot be attributed to matter beneath the skull, is certain, because the time would not have been sufficient for the formation of matter, and there have been no symptoms of inflammation of the dura mater. Here any re-

* Some very interesting cases, illustrating this fact, are contained in Klein's *Chirurgische Bemerkungen*, 12mo. Stuttgart, 1801, p. 113, &c. In some of these examples, the patients remained well and sensible more than a month, and were then seized with fever, shivering, convulsions, paralysis, &c. which soon destroyed them. What is curious, it was sometimes found, that though the symptoms began thus late, and perhaps proved fatal in two or three days, a large portion of the brain and its membranes was inundated with matter; abscesses formed in its substance; parts of it were destroyed; its membranes considerably thickened; and even the cranium broken. We must here suppose, either that such disease was going on for a time, without producing any particular bad symptoms, or that its progress was most rapid after it had once begun.

† *Œuvres de Desault par Bichat*, tom. ii. p. 24.

‡ *Op. cit.* p. 25.

fleeing man must know, that hemorrhage within the skull has taken place, and that, in proportion as the quantity of effused blood increased after the accident, it induced the bad symptoms under which the patient labours.

Unfortunately, much obscurity is frequently occasioned by the effects of extravasation taking place before those of concussion subside, in which case, no interval of sense occurs, and we know not whether to ascribe the general insensibility to the former or the latter cause. But the worst cases of all are those, in which concussion and extravasation are co-existent.

When the quantity of blood is at first small, drowsiness and head-ach may be the only symptoms. When, however, the pressure on the brain increases with the increasing extravasation, the patient is gradually deprived of all sensibility. His eyes remain half open ; his pupils are dilated ; the iris does not move, even when a candle is brought near the eye ; there is no sickness, which would betray sensibility in the stomach and œsophagus ; the pulse is generally slow ; the feces and urine pass involuntarily ; and respiration is carried on with difficulty, and with a stertorous noise.

These symptoms indicate, with tolerable certainty, both extravasation and dangerous pressure on the brain ; but the surgeon has few or no means of judging with precision where the effused blood is situated, nor of course where he should perforate the cranium with the trephine. He neither knows whether the blood lies immediately under the skull, upon the outer surface of the dura mater ; between the dura mater and tunica arachnoides ; in the convolutions ; in the ventricles ; or deeply in the substance of the brain. Supposing it to lie upon the dura mater, he knows not the exact point of its situation.

The common rule, in these cases, is to apply the trephine to the place where any traces of external violence appear, the extravasation being often situated under that part of the skull which received the blow. Should an appearance of contusion be manifest on the scalp, after the head has been shaved and carefully examined ; should the scalp be wounded ; or lastly, should there be a visible fracture of the cranium ; the perforation is to be made in the situation of these injuries. The practitioner, however, has often the mortification to find, that the extravasation is not under the part of the skull, which has been perforated. In this dilemma, if the dura mater should appear prominent at the opening, as if blood were under it, some surgeons advise a puncture to be cautiously made in it. This practice might indeed sometimes let out a small quantity of serum ; but as blood, in this situation, is always

widely diffused, an effectual discharge of it is impracticable. As for extravasations more deeply situated, the uncertainty of their exact place must generally prohibit a prudent surgeon from meddling with them.

Paralysis is a symptom of pressure of the brain ; when it affects one side of the body more than the other, and one pupil seems more dilated than its fellow, the extravasation is mostly on that side on which there is least paralysis, and least dilatation of the pupil. Sometimes, however, though the paralysis affects only parts of one side of the body, the extravasation is diffused, and not restricted to the opposite side of the brain.

When blood lay on the dura mater, Mr. Abernethy found, that the bone above it would not bleed when scraped : a remark well deserving recollection.

Desault, in the enumeration of his reasons for renouncing the trephine, notices the possibility of extravasation happening without any dangerous symptoms. Here, however, no surgeon would trephine, because the bad symptoms are the only true reason for the operation ; nor without them would the extravasation be even suspected. With regard to the uncertainty of the diagnosis, I believe Desault was incorrect in denying the possibility of distinguishing the difference between the symptoms of extravasation and those of concussion, phrenitis, &c. Such discrimination has certainly been made with considerable success by Mr. Abernethy ;* and some of the symptoms, characteristic of the several cases, as related in this publication, will not be likely to be confounded.† It is principally in mixed cases, as when a man is labouring under the effects of concussion and compression together, and

* Surgical Works, vol. ii.

† Klein relates a case which furnishes a useful caution : a little girl, five years old, fell out of a carriage, pitched upon her head, and the hinder wheel passed over her right side. She got up directly afterwards, with a considerable wound of the forepart of the scalp, five inches in length. In the course of a day or two, she became feverish, talked incoherently, vomited several times, and was exceedingly thirsty. Notwithstanding antiphlogistic remedies, the symptoms soon became worse ; the child being in a state of stupor, and of a deadly pale colour, with twitchings of the face, stertorous and difficult respiration, a tremulous pulse, which could not be counted, involuntary discharge of the feces, frequent convulsions, inability to swallow, &c. The wound of the scalp had united very well at the edges, but the flaps were hollow, and from the cavity an unhealthy matter yet issued. Klein was required to apply the trephine, but he thought the symptoms not clear enough, and therefore waited. The child died, and on examination of the body, the cranium and its contents were perfectly sound ; but in the chest, the right lung was found violently inflamed, and filled with blood ; and a quantity of bloody serum in the cavity of the pleura. The

perhaps inflammation, that obscurity and uncertainty will be experienced.

PRESSURE ON THE BRAIN FROM MATTER.

When a great deal of matter collects on the surface of the dura mater, it finally produces symptoms of pressure on the brain; but, previously to their occurrence, the patient must have betrayed signs of an inflamed dura mater, while, in the situation immediately over the matter beneath the cranium, the symptoms of pressure from this cause must have been preceded by a puffy, circumscribed, indolent tumor of the scalp, and a spontaneous separation of the pericranium. If a wound be immediately over the part of the cranium covering the suppuration of the dura mater, the edges lose their vermilion hue, and become pale and flabby; instead of healthy pus, a thin gleet is discharged, and the pericranium is loosened from the skull, for some extent from the edges of the sore.

This case demands the immediate application of the trephine, in order to let out the matter confined beneath the bone. Antiphlogistic treatment, copious bleedings, saline purgatives, antimonial, quietude, and low diet, are here strongly indicated.*

CONCUSSION.

Its first effect essentially consists in a sort of contusion, or general irritation of the brain, occasioned by the shock which every part of this organ receives. The nature of such shock is readily conceived, when we recollect the way in which contusing bodies act upon the cranium. When the skull is struck, it changes its shape; it becomes flattened in the direction of the violence, and widened in the opposite direction, as happens in the same circumstance to every round elastic body.

posterior part of this membrane was exceedingly inflamed; a great quantity of blood extravasated between it and the intercostal muscles; and to the surgeon's astonishment, the five first ribs fractured. *Chirurgische Bemerkungen*, p. 141.

* Besides the kinds of pressure here specified, as requiring the trephine, there is another case particularly insisted upon by Larrey: I allude to the lodgment of a ball or bullet between the fragments of a fractured skull, or to the entrance of the same within the cranium, near some part of which it continues lodged. This author records one surprising case, in which he trepanned the os frontis, and removed an iron ball, that weighed seven French ounces, off the anterior and right lobe of the brain: the patient completely recovered. See *Mém. de Chir. Militaire*, t. iv. pp. 183—185.

Hence, the brain suffers an universal shaking and compression, and having been contused and irritated, an increased determination of blood to it has always a tendency to follow. The truth of this doctrine is proved by experience, which teaches us, first, that, in the majority of cases, inflammation of the brain succeeds concussion; secondly, that the best method of preventing the secondary effect, is to excite an artificial irritation, which counteracts the effects of that to which the brain has been subjected.*

Concussion may happen in very different degrees. How many varieties exist between that slight stunning, the sudden effect of an inconsiderable blow, and that complete disorganization, which, at the instant of the injury, annihilates at once all power of motion and every spark of life!

When the concussion is slight, a transient stunning, a little pain in the head, acceleration of the pulse, vertigo, and sickness, are sometimes immediately experienced; but, none of these complaints last long, especially if evacuation be used.† In certain instances, however, the dura mater inflames after slight blows on the head, and this at a period when sometimes there is not the least apprehension of danger.‡ If the violence has been great, the patient is directly stunned and thrown into a state of total insensibility; his extremities become cold, his pulse is weak, slow, and intermitting; his respiration hardly perceptible; and his power of motion abolished. This is what Mr. Abernethy considers as the first stage of concussion. In proportion as the stupefaction, arising directly from the injury, goes off, (supposing the violence not to exceed a certain degree, for then no signs of returning sensation follow,) sickness, increased frequency of the pulse and respiration, more or less motion, and other symptoms, take place, followed by marks of inflammation of the brain. The tendency to phrenitis, in fact, always increases as the first effects of concussion subside. If the patient's eyelids be now opened, he will shut them again in a peevish manner; the pupil is contracted, and though the patient is regardless of slight impressions, he is not by any means insensible. As the case advances, the patient gets no sleep at all; has a wild look; an eye much like that of a person who has long watched through apprehension and anxiety; talks much and very inconsistently; has a hard

* *Œuvres de Desault*, tom. ii. pp. 57, 58.

† *Pott's Chirurg. Works*, by Earle, vol. i. p. 40, edit. 1808.

‡ For illustrations of this important truth, I would particularly refer to the writings of Pott and Klein.

labouring pulse ; if not restrained he will get out of bed, and act with a kind of frantic absurdity ; and, in general, he appears much hurt by a strong light. As the signs of delirium increase, the pulse becomes small, frequent, and even rapid. The inflammation under the skull may now produce suppuration, or a copious effusion of serum, and the foregoing afflictions may be followed by those depending on the pressure of the secreted fluid.

Death is the unavoidable consequence of violent concussion ; such is then the extent of the disorder, that every means is incapable of re-establishing the functions of the brain. But when the injury, which this organ has received, is less considerable, its functions may be gradually restored in a more or less perfect state. Frequently the patient is for ever afterwards affected by the accident. Imbecility, loss of memory, and a marked change in the character, are sometimes the permanent consequences. In certain instances, the patient's memory remains weakened, and he can only recollect things which have very recently attracted his attention. Desault used to cite a curious case, in which the patient could at first only remember circumstances with which the mind had been lately impressed ; but afterwards, he could recollect nothing, except what had happened in his childhood. Mention is also made of a lunatic, who was so fortunate as to recover his reason, in consequence of an accidental concussion of the brain.*

The treatment, of which I entertain the highest opinion, consists in taking away blood freely and repeatedly from the temporal artery and arm, giving tartarized antimony, administering saline purgatives, and aperient clysters, and ordering a low diet. In the first stage of concussion, indeed, when all the functions of life are at the lowest ebb, such measures are not indicated ;† and stimulants (especially external ones) may be allowable ; but, when the second stage arrives, which is invariably joined with a tendency to inflammation of the brain and its membranes, the antiphlogistic treatment affords the best chance of preservation. Counter-irritation should also be excited on the outside of the head, by means of a large blister. Leeches will often be useful, and linen, wet with a

* *Œuvres de Desault*, tom. ii. pp. 59—61.

† Mr. Hey, among others, thinks a copious bleeding injurious "during the diminished state of the *vis vitæ*, which immediately succeeds the injury." He has seen great benefit arise from the warm semicupium, and blistering the head after topical bleeding. *Pract. Obs. in Surg.* p. 486. edit. 2.

cold lotion, may be laid on the temples, and any part of the head not covered with the blister.

Copious bleeding has not been universally approved of as a means of relieving concussion. In a few cases, Desault bled once; but he never carried the bleeding so far as to open a vein a third* time. He preferred a stimulating plan of treatment, and especially that of keeping up a counter-irritation on the whole scalp, and giving antimonials.

Others, not content with external stimulants, have had recourse to the internal exhibition of opium, brandy, wine, liq. ammoniac, and aether. This practice, I think, arose from the two stages of concussion not having been formerly discriminated.

PHRENITIS.

When, in consequence of external violence, the substance of the brain inflames, the case is attended with hardness, frequency, and strength of the pulse; slow full respirations; broken sleep; redness of the tongue; animation of the countenance; excessive sensibility of the retina to the impression of the light; a full, red, and inflamed appearance of the eyes; an acute throbbing pain in the head; general heat of the body; disturbance of the intellectual faculties; and, after a time, vertigo, loss of sense, delirium, coma, and convulsions. But, when the membranes of the brain are principally affected, the pulse is contracted, frequent, and small; the fever characterized by a dull pain in the head; dryness and burning heat of the skin; vomiting; clammy furred tongue; high-coloured urine; delirium; loss of sense, &c. In most examples, however, the brain and its membranes are more or less inflamed together, and hence, in general, the symptoms do not precisely correspond to either of these descriptions.

Inflammation of the brain, and its membranes, is a case that generally requires a very free use of the lancet, and the operation is to be repeated, according to the patient's strength, and the state of the symptoms. There is an advantage in taking blood from the temporal artery; or, in conjunction with venesection, blood may be drawn from the temples by leeches, or cupping glasses. The skin ought to be kept moist with antimonials, which should be given in nauseating doses, so as to have the effect of suddenly lessening the impetus of the circulation. Counter-irritation should be excited on the scalp with

* Op. cit. p. 64.

blisters, or, at first, the head may be covered with linen wet with ice-cold water, or an evaporating lotion. Laxative clysters, saline purgatives, a very low diet, and a quiet, rather dark room, are also proper.

THE OPERATION OF TREPHINING

Consists in removing a portion of the skull, and is usually done in order to raise a part of the bone producing dangerous pressure on the brain; to discharge collections of matter, or blood, which have the same effect; or to extract a ball, or other foreign body lodged under the skull.

Every part of the cranium cannot be trephined with equal safety. However, the mere presence of a suture ought not to deter the surgeon from making the perforation in any place which seems advantageous. I believe, also, that the fears, respecting wounds of the longitudinal sinus, have been vastly exaggerated, and that if the situation of a depressed fracture, or extravasation, demanded the removal of a piece of the skull directly over this vessel, the operation would be justifiable. The longitudinal sinus has often been wounded by spiculæ of the cranium, in cases of fractures; and it has been purposely punctured with a lancet, in order to bleed the patient; yet, the hemorrhage was never known to be troublesome, after a little bit of lint had been applied.*

But, though I feel warranted in making this statement concerning the longitudinal sinus, I am not acquainted with any facts, showing that hemorrhage from the lateral sinuses would not be likely to prove more serious. These latter are much larger, and as they occupy the deep transverse furrows, in the middle of the inner surface of the os occipitis, a trephine applied over them would inevitably wound them.

Authors generally interdict the application of the trephine to the anterior inferior angle of the parietal bone, on account of the trunk of the spinous artery of the dura mater being situated in a groove on the inner surface of that part of the skull. For my own part, I should never be afraid of trephining here; for, if the above vessel were wounded, a little dosil of lint, introduced into the opening, would immediately stop the bleeding.

It is a maxim to avoid trephining any part from which a

* Cases in Surgery, by J. Warner, p. 8 edit. 4; Marchetti, Obs. 4.; Sharp's Operat. p. 144. edit. 3, Pott's Chirurg. Works, vol. i. pp. 156—159. edit. by Earle. 1808.

complete circle of bone cannot be sawn, without hurting the dura mater. The inequalities on some parts of the inner table of the skull, make attention to this rule necessary. Thus, the centre of the forehead is rather an inconvenient part for the trephine, because when the spine of the os frontis is prominent, it could not be sawn, without the dura mater being wounded by the teeth of the saw. Should the surgeon apply the trephine to this place, he must be careful not to saw too deeply; and complete the separation of the circle of bone with the elevator, instead of making any dangerous attempt to saw entirely through the projecting spine.

Surgical writers caution us not to trephine over the frontal sinuses, and, not without reason; for, if the perforation be continued in the direction in which it begins, the inner table will be sawn entirely through, on one side of the circle, before the other is at all divided. However, the outer table may be first removed with a large trephine, and the inner table then perforated with a smaller one, placed evenly and perpendicularly on the posterior surface of the sinus.*

The trephine cannot be applied lower down on the forehead than half an inch above the superciliary ridge of the os frontis, without risk of injuring the orbit. If requisite, the trephine may be applied to the squamous portion of the temporal bone; for, wounds of the temporal muscles are not at present so much dreaded as they were by our ancestors. The unevenness of the os occipitis; the course of the longitudinal and lateral sinuses; and the way in which a part of this bone is covered by muscles; have made surgeons fearful of applying the trephine to it. However, there are two small spaces on each side of the groove for the longitudinal sinus, where a trephine may be safely applied.† The operation may even be done below the transverse ridge, near the foramen magnum, the muscles attached to that part of the bone being no valid objection, as a division of them is not dangerous, while unrelieved pressure on the cerebellum would certainly be fatal.‡

When the bone is already sufficiently exposed by a wound, the operation may commence at once; but otherwise, it is first requisite to make room for the application of the trephine, by making an incision of a crucial form, or shaped like the letters T or V. None of the scalp should ever be

* C. Bell's Operative Surgery, vol. i. p. 439.

† See Warner's Cases, p. 18. edit. 4.

‡ Med.-Chir. Trans. vol. ii. p. 104.

removed, as it is quite unnecessary, and might afterwards occasion serious deformity.

The incision should be made directly down to the bone; but, in cases of large fractures, attended with great separation of the broken edges, or with loose pieces, the danger of pressing too hard with the knife is obvious.

Mr. Pott informs us, that a suture, or the impression of a vessel on the surface of the bone, may be discriminated from a fracture or fissure, by the undetached state of the pericranium. This membrane is always found loose and detached from the track of a fracture; besides which, the edges of a fracture constantly seem rough to the probe or finger. The natural situation of the sutures is also a source of information to a surgeon not deficient in anatomical knowledge.

It would be dangerous to apply the trephine to depressed portions of the skull. The perforation is always to be made on that side of the fracture, where the elevator can be most conveniently introduced beneath the depressed bone, for the purpose of raising it. In cases of extravasation, the perforation ought to be made at the place, where there are traces of violence done to the scalp.

When the scalp has been divided, and loose splinters of the cranium are found under it, they ought to be taken away with the forceps or finger; for, they can only be regarded as extraneous bodies, the continuance of which may be productive of dangerous irritation. The depressed pieces of the skull, causing the bad symptoms, are sometimes completely detached from the rest of the cranium, and may be taken away in the same manner.

In every instance of fracture with depression, unattended with any motives for supposing that part of the pressure on the brain arises from extravasation, provided such depressed fracture can be raised with a pair of forceps, or an elevator, without applying the trephine, the latter operation may be dispensed with.

It is customary to scrape the pericranium from the part of the bone on which the crown of the trephine is to be placed; but, if this instrument cut well, no such proceeding is necessary.

In order to fix the centre-pin of the trephine, surgeons make a small hole in the external table of the skull, with an instrument named a perforator. The crown of the trephine is to be alternately turned in one direction, and then in the other, by the pronation and supination of the surgeon's hand. As soon as the teeth of the instrument have made a circular groove, sufficiently deep for fixing the trephine, the centre-

pin is to be removed, lest it should injure the dura mater, before the internal table of the cranium is perforated. At first, the operation may proceed with briskness, as the surgeon cannot possibly do mischief; and, every now and then, the trephine is to be taken out of the circular groove, in order that the bone dust may be brushed from the teeth of the instrument.

When the sawing is more advanced, the surgeon must proceed with greater caution, and frequently examine, with the point of a quill, whether any part of the circle is nearly or completely sawn through. When this is the case, the pressure of the instrument is to be inclined to the parts which are not sufficiently perforated. It is always better to use a little force in raising the circle of bone with the elevator, than to run any risk of injuring the dura mater and brain, by sawing too deeply.

In a few cases, the surgeon clearly perceives the entrance of the saw into the diploe, by the sensation which the instrument communicates to his fingers, in consequence of entering a soft substance, immediately after having divided the hard texture of the outer table, and by the blood which then appears in the circular groove, and on the teeth of the saw. The operator, however, is not warranted in sawing too boldly until a criterion of this sort takes place; for, in many skulls, and in different parts of the same skull, the diploe is very thin, and, in old persons, it is sometimes quite obliterated.

When the surgeon knows with certainty that he has arrived at the diploe, the rest of the sawing should be accomplished with slowness and circumspection. After having removed the circle of bone, if the lower edges of the perforation next the dura mater are splintered, they may be made smooth by means of an instrument, called a lenticular.

When the whole track of the depression cannot be raised, or all the blood or matter cannot be discharged, by making one perforation, the trephine must be applied again; and indeed as often as the circumstances of each particular case demand. Sawing out large portions of the skull, however, should always be avoided, if possible, because it may be itself the source of bad and even fatal consequences; but it is certainly less dangerous, than not completely effecting the object of the operation, viz. the removal of the pressure from the surface of the brain. Pain is here no objection; for the majority of patients, on whom it ought to be practised, are in an insensible condition.

When the operation is finished, the scalp is to be laid down

in its natural position, and dressed very lightly with a pledget of any simple unirritating ointment.

The importance of preserving every part of the cranium, which the safety of the patient does not compel us to remove, is a truth with which I am forcibly impressed. Nor can it be disputed, that the trephine is often an objectionable instrument, since the piece of bone sawn out must always be of one figure, whatever be the form of the fracture; and the quantity of bone removed must frequently be greater than the case requires.* Hence the late Mr. Hey seldom used the trephine, or trepan, but saws resembling those delineated in the annexed plate.† With the convex one, the bone may be sawn in a curvilinear direction. There are undoubtedly numerous cases, in which it is unnecessary to remove a whole circle of the cranium for the purpose of raising a depression; for instance, if the fracture were shaped like the letter V, and beaten inward, by making a division across its base, the depressed portion might easily be taken away.



CHAPTER II.

OF ENCEPHALOCELE; FUNGUS, OR HERNIA CEREBRI.

WHEN a portion of the brain, together with its membranes, protrudes through a preternatural opening in the cranium, the disease receives the above appellations. There are several varieties of this affection.

One case sometimes occurs in young children before the ossification of the cranium is completed, and then the tumor is covered by the common integuments of the head. In one example of this kind, the falxiform process of the dura mater was contained in the swelling.‡

This species of encephalocele usually appears as a soft, smooth, round tumor, which has a pulsation corresponding to that of the arteries. It yields and disappears under com-

* See Hey's Practical Obs. in Surgery, p. 7. edit. 2.

† Plate III.

‡ Corvinus de Hernia Cerebri, in Haller. Disp. Chirurg. t. ii. p. 333.



pression, is generally unattended with any change in the colour of the skin, is formed in the situation of the fontanelle and sutures, and its circumscription depends on the extent of the deficiency of bone.* The proper treatment is to keep up a moderate pressure on the swelling. Ferrand successfully employed for this purpose a compress, containing a piece of sheet-lead, and fastened to the child's cap exactly over the tumor. The degree of pressure was increased or diminished, as occasion required, by tightening or slackening the cap.

Another species of encephalocele is rather to be regarded as a malformation, being the consequence of a congenital deficiency of an extensive portion both of the cranium and scalp. In such cases, the infant is generally still-born, or dies soon after birth. A remarkable example of this disease was published by Dr. Burrows. The scalp, the os frontis, the parietal, and a great part of the occipital bones, were wanting. The cerebrum, which projected through the deficiency, was of a mulberry colour, and the tumor was adherent at its neck to the edge of the integuments. This child lived till the sixth day after its birth; it had no power of voluntary motion, and all the secretions were stopped.† In one case, where there was a deficiency of the skull at birth, the plexus choroides was found in the contents of the tumor under the scalp; and, in another instance, the cerebellum.‡

The foregoing kinds of encephalocele are rare compared with others, which sometimes follow the destruction of a part of the skull by disease,§ or the operation of trephining. In the latter case, the tumor generally arises a few days after the perforation of the cranium. It protrudes through an ulcerated opening of the dura mater, and very soon attains the magnitude of a pigeon's or hen's egg, the pia mater covering it seeming inflamed. As it enlarges, frequent hemorrhages occur, and its surface is commonly darkened with coagulated blood. In a few cases, it is not attended with loss of the mental faculties, though, in most instances, we find that coma, insensibility, and other marks of pressure on the brain, accompany the disease.

According to Mr. Abernethy, this singular case proceeds from an injury done to a part of the brain at some distance from its surface, which injury produces a diseased state of the vessels, similar to what occurs in apoplexy. The morbid state

* Ferrand, *Mem. de l'Acad. de Chirurg.* tom. v.

† *Med. Chir. Trans.* vol. ii. p. 52.

‡ See Richter's *Anfangsgr. der Wundarzn.* b. ii. p. 198. edit. 3.

§ Richter's *Chir. Biblioth.* 2 B. 1 St. Seite 159.

increasing, one or more vessels give way, and an effusion of blood in the substance of the brain follows. This occurrence, if the skull were entire, would probably occasion apoplexy ; but when there is a deficiency of bone, allowing the brain to expand, this viscus and its membranes protrude through the aperture. The dura mater soon ulcerates, and the tumor rapidly increases, in proportion as the internal hemorrhage goes on. At last, the pia mater, and stratum of the brain, covering the effused blood, give way, and the blood oozes out and coagulates.* In the cases recorded by Mr. Stanley, however, the protrusion consisted both of the cortical and medullary substance of the brain, and the effused blood is described, as merely lying upon the surface, and not extending thence to any other place, in which it had been originally effused.†

That all cases do not correspond with Mr. Abernethy's description is certain. Thus we have on record the account of a man who, without having any previous disease or accident, became afflicted with a pulsatory swelling, which originated from the substance of the anterior part of the left lobe of the brain, protruded through the os frontis, was as large as an orange, and on dissection was found to resemble the medullary matter of the cerebrum in appearance, and to be covered by an elongation of the dura mater.‡

Mr. C. Bell represents the *hernia cerebri* as a true organized vascular growth from the substance of the brain, and not as a mere protrusion. He has seen the disease arise after an exfoliation of the two tables of the skull, when no blow had happened to cause any rupture of blood-vessels within the brain ; and he states, that the removal of bone, and the ulceration of the dura mater, always precede the growth of the fungus.§

The proper line of surgical conduct in such cases as follow trephining, is hardly yet determined. Mr. Hill successfully pared off the tumor with a knife in several instances ;|| and patients have been known to tear off the whole tumor, without any particular ill consequences.¶ In the case recorded by Mr. Pring, the removal of the protruded mass, and the employment of pressure, were followed by the recovery of the

* Surgical Works, vol. ii. p. 51.

† See Medico-Chir. Trans. vol. viii. p. 12, &c.

‡ Med. Trans. art. 18.

§ Operative Surgery, vol. i. p. 428.

|| Cases in Surgery, pp. 91, 92.

¶ Mém. de l'Acad. de Chir. tom. i. Mem. par M. du Quesnay, obs. 16

patient.* The French surgeons also recommend either cutting the tumor away, or repressing its growth by applying turpentine to it, and gentle pressure.† In one instance lately published, the whole tumor, which equalled a small orange in size, "was sliced off with a scalpel," without any particular pain being excited. A profuse hemorrhage took place from the exposed surface of the brain, "the blood being thrown with great force, and to a considerable distance, from numerous vessels, which were attempted to be secured, but ineffectually, by ligatures. After a short time, however, the bleeding ceased." On examination of the part which had been cut off, its exterior was found to consist merely of a layer of coagulated blood; the rest of the mass was brain, possessing a natural appearance, the distinction between the cortical and medullary matter being readily seen, with the convolutions and pia mater descending between them. During the remainder of the day, on which the operation had been performed, "the boy, on the whole, was more tranquil. For the next two days, he remained much in the same state; but, on the third, he became worse; was completely insensible; had strabismus, and a remarkable quickness of the pulse. On the following morning he died."‡

On the whole, the results of various cases on record appear to sanction the application of pressure, which, in cases where the tumor is already large, must be preceded by a removal of the protruding mass with a scalpel. Considering the state of the brain, I should also be generally inclined to combine with such treatment copious bleeding. In one interesting case, where the whole swelling had been removed down to a level with the skull, the cut surface of the brain bled freely from numerous vessels of large size. Firm pressure was then made. The disposition to protrusion after a few days ceased. The protruded matter, which had hitherto resembled healthy brain, now put on another appearance. The exposed cerebral substance lost its natural colour; acquired a light yellow appearance; was split into several portions; and a fetid odour exhaled from it. Its substance daily became softer, and the whole gradually wasted away. As the dead and putrid brain was detached, *fresh granulations rose up to fill the vacancy, evidently produced from the exposed substance of the*

* Edinb. Med. and Surg. Journ. vol. ix.

† Richerand Nosogr. Chirurg. tom. ii. p. 289. edit 2.

‡ Stanley, in Med. Chir. Trans. vol. viii. p. 15. The pressure, which was endured without ill effects in the examples related by this gentleman, is truly surprising.

brain. During these changes, which occupied several days, the boy's health was good. At each dressing of the wound, moderate pressure was still made. By this means, the granulations, filling the space before occupied by the protruded brain, became daily more flattened, and at length brought down to the level of the skull, when their cicatrization commenced, and proceeded with such rapidity, that, in a few days, the whole wound was perfectly healed, and the boy in every respect well.*

Unfortunately these are generally complicated cases, the brain being deeply and extensively diseased. Thus, in the examination of one case, after death, it was found, "that all that part of the dura mater, adjacent to the ulcerated aperture, through which the brain had protruded, was black, sloughy, and much thickened. The exposed surface of the brain, from which the portion had been cut off, exhibited a softened and broken down texture; a state of disorganization, which extended deeply into its substance. About an ounce of fetid and dark-coloured fluid was found between the dura mater and arachnoid membrane; several small effusions were met with both between the membranes and in the substance of the brain. The arachnoid coat was thickened and opaque over each hemisphere," &c.†



CHAPTER III.

FUNGOUS TUMORS OF THE DURA MATER.

FUNGOUS tumors sometimes grow from the external surface of the dura mater, and, after destroying the superincumbent portion of the cranium, make their appearance in the form of an external swelling under the scalp. They are generally preceded by a blow, or fall on the head, and occur at the part to which the violence was applied.

As the fungus grows larger, its pressure against the skull, and particularly its pulsatory motion, derived from that of the brain, occasion a slow and gradual absorption of the bone, just in the same way as an aneurismal tumor destroys any

* Stanley in Med. Chir. Trans. vol. viii. pp. 20—22.

† Ibid. p. 16.

part of a bone against which it happens to press. The portion of the cranium immediately over the swelling being absorbed, the fungous excrescence meets with less resistance; it quickly protrudes through the opening in the skull; forms a prominent tumor under the scalp; and enlarges with increased rapidity. The severe pains in the head, which precede the external appearance of the disease, become still more violent as soon as the fungus protrudes through the opening in the bone, and is irritated by the sharp inequalities of its edge. The swelling has a manifest pulsation, corresponding to that of the arteries, and when compressed, it either returns entirely within the cranium, or is considerably lessened. The pain then subsides, the tumor being no longer irritated by the irregular circumference of the opening in the skull. If the size of the fungus be large, no relief can be thus obtained; for, when an endeavour is made to reduce the tumor, all the alarming symptoms of pressure on the brain are immediately excited.

Fungous tumors of the dura mater constitute a very dangerous form of disease, and mostly prove fatal.

Before fungus of this description has made its way through the cranium, and projected under the scalp, so that its nature and existence can be ascertained, the practitioner has no opportunity of attacking the disease with any effectual means. The ordinary treatment of the severe pain occurring in certain parts of the head, after blows or falls on the cranium, and before the fungus protrudes, has consisted of bleeding and evacuations. But when the disease has manifested itself in the form of an outward swelling, the nature of which is recognised from previous circumstances, as well as from the pain which attends it, and subsides on its reduction, and its pulsatory motion; the head should be shaved, a crucial incision made in the scalp covering the fungus, the angles dissected up, and the whole of the tumor, and the margin of the opening through which it protrudes, fairly exposed. But as it is impossible to get at the entire root of the fungus, while it is closely embraced by the cranium, it becomes necessary to saw away the surrounding bone. This object has generally been accomplished very inconveniently with the trepan or trephine, which, while it cuts away more of the cranium than is requisite, cannot effect the removal of every part of the bony circumference, and the surgeon is obliged to break away the pieces betwixt the perforations. The best instruments for cutting away the surrounding part of the cranium, are Mr. Hey's saws.

The root of the fungus being thus exposed, the next busi-

ness is to cut the swelling away, which is most effectually done by carefully dissecting out the part of the dura mater with which it is connected.

The excision of fungous tumors of the dura mater is far better practice, than applying ligatures or caustic to them.



CHAPTER IV.

WOUNDS OF THE FACE.

As any disfigurement of the face is peculiarly conspicuous, it is always a great point to prevent the formation of ugly scars upon it. Hence, it is an invariable maxim to endeavour to heal its wounds by the first intention.

As cuts, confined to the soft parts of the face, cannot be deep, adhesive plaster is generally sufficient to keep them closed; but when the wound is situated in one of the lips, the part is so incessantly in motion, that surgeons find it advantageous to maintain the sides of the division in contact by means of the twisted suture.

When the edges of the wound are much contused and lacerated, they should be pared off, to increase the chance of union, and lessen the future scar.

Sabre-strokes, directed obliquely downward against the face, often produce a wound attended with a flap, which should be immediately laid down in its proper situation again. When the flap is large and muscular, a suture may be applied at one or two points.

Sabre-wounds sometimes break and splinter the bones of the face. The fracture, however, seldom extends far, because most of these bones are soft and spongy. Notwithstanding this complication, the soft parts frequently admit of being evenly united, particularly if care be taken to extract all the splinters, and put the surfaces of the division of the bones accurately together. Unless the fragments be quite detached, they should never be taken away, but be replaced as well as circumstances will permit. Their removal is not an easy matter; it occasions an unpleasant disfigurement; and experience proves, that all divisions of these bones heal with great readiness.*

* Anfangsgr. der Wundarzn. band. i. p. 244. edit. 3.

A very terrible sabre-wound of the face is recorded by Dr. Hennen. The weapon struck an officer nearly across the eyes, one of which it destroyed; it then divided the parts downwards and backwards, to such an extent, that the pharynx could be seen.* Yet the injury healed very favourably, as indeed do the generality of wounds of the face, owing to its great vascularity. In some horrid cases, where the lower jaw is torn away by a cannon-shot, life is preserved; but, in general, the patient sinks under the accumulated tortures of his situation. "It is still, however, our duty to try every expedient; and, after the ragged parts and splinters of bone are removed, the vessels within reach secured, and the suppurating process fairly established, we may endeavour to assist nature, faithfully following any effort she may make to fill up the chasm, but without allowing ourselves to count upon a showy or complete cure."† Dr. Hennen saw one dreadful case recovering, in which nearly one-half of the face had been carried away by a round-shot at Waterloo. Larrey has recorded a similar case;‡ and I witnessed in Holland a recovery of the same nature. It was the case of a soldier wounded at Bergen-op-Zoom, in 1814. All the lower jaw, and a large part of the upper, were in this instance completely torn away: there was very little hemorrhage, and no vessels required ligature. In injuries of this description, the usefulness of an elastic catheter, for the conveyance of food and medicines down the œsophagus, is often very great.

Wounds of the lower part of the forehead or eyebrow, are sometimes followed by the disorder named *ptosis*, in which the upper eyelid hangs down; but they more commonly give rise to an opposite complaint, called *lagophthalmos*, in which, from the contraction of the cicatrix, the skin is drawn up, and the eyelid cannot cover the eye.

Wounds of the eyebrow are sometimes followed by amaurosis, a case generally very difficult of cure.

Wounds of the eyelids scarcely admit of an effectual application of adhesive plaster, and are generally brought together with a suture.

Cuts of the ear usually heal very favourably. A suture may be advantageous; but it need only be passed through the skin, and not through the cartilage. Ravaton has recorded a case, in which the ear united again, though nearly sepa-

* Obs. on Military Surgery, p. 370; also, Larrey, *Mém. de Chir. Militaire*, t. iv. p. 20.

† Op. cit. p. 373.

‡ *Mem. de Chir. Mil.* t. iii. p. 328.

rated from the head ; and it is important in every similar instance to make the attempt, since the loss of the external ear would create an imperfection of hearing.

When a part of the nose is divided, but not entirely detached, it is the duty of the surgeon to replace it as expeditiously as possible, and retain it in its situation with strips of adhesive plaster, and, if necessary, a suture. Putting out of the question Garengéot's extraordinary case, to which I have elsewhere adverted, we have many facts on record, showing not only that most incised wounds of the nose admit of union, but also, that contused ones, attended with an almost complete detachment of the part, may often be united.*

As the parotid duct passes beneath the integuments of the cheek over the masseter muscle, it is much exposed to wounds, which, if not properly treated, end in what are termed salivary fistulæ.



CHAPTER V.

SALIVARY FISTULÆ.

A SALIVARY fistula is an opening on the cheek, from which the saliva escapes, more especially when the patient is eating or talking, and it flows out so profusely as to wet the patient's clothes. During a meal, two ounces of it have been known to escape in the short space of a quarter of an hour. The great loss every day of a fluid so serviceable in digestion, produces loss of appetite, indigestion, weakness, and emaciation; and the constant dribbling of the saliva over the adjacent parts, is at least a vexatious annoyance.

A wound, an ulcer, or gangrene, extending either to the parotid gland or duct, is the cause of the disorder. When the first part is interested, the fistulous opening is close to the ear ; when the duct itself is concerned, the aperture is on the cheek. Sometimes calculous concretions are formed in the parotid duct, like those frequently met with in the salivary ducts under the tongue. In general, they do not cause much inconvenience before they are large, when they occa-

* Richter's Chir. Bibliothek, 6 B., seite 538. Larrey, *Mém. de Chir. Militaire*, t. iii. p. 328, t. iv. p. 20, &c.

sion an abscess, which either bursts on the cheek, or is opened ; and, if the nature of the case should not have been previously suspected, it now becomes evident, from the quantity of saliva discharged from the aperture ; the sore not healing, but becoming fistulous ; and the facility, with which the calculus may be felt with a probe.

When the parotid duct is recently wounded, an attempt may be made to unite the wound by the first intention, in the expectation that one end of the duct itself may, at the same time, coalesce with the other. But when the wound has existed a good while, the latter hope would be vain ; for the part of the parotid duct, detached from the gland, is generally too much shrunk, or even quite obliterated.

Another plan, commonly pursued, is to apply a graduated compress to the fistulous aperture, or more properly just at its outer edge. M. Pipelet devised an instrument for making the requisite pressure.* In this manner, fistulæ of the parotid gland itself may generally be cured. But when the fistula proceeds from the duct, the method seldom answers, unless the wound be quite recent, and the pressure not likely to be required long ; for then the hinderance of the excretion of the saliva gives rise to a painful and œdematous enlargement of the gland, extending a considerable way down the neck.

Desault cured a salivary fistula of the parotid duct by means of pressure, but quite on a new principle. After compression of the duct had been tried in vain, he laid compresses over the parotid gland, and bound them on the part with a roller, enjoining the patient to live entirely on liquid food, and abstain from talking. The bandage was tightened anew every day. By pursuing this method a certain time, the gland wasted away, its function was abolished, no more saliva passed into the duct, and the fistulous opening healed. Disorder of the digestive organs, from a less quantity of saliva being secreted, need not be apprehended ; for the opposite parotid, and the rest of the salivary glands, make up the deficiency, by augmenting their secretion.†

The application of caustic to the fistulous aperture is another method. It is practised with the view of producing an eschar, sufficient to close the opening, and prevent the issue of the saliva, when the fistula sometimes heals under the

* Mém. de l'Acad. de Chirurgie, tom. v. p. 869. tab. 19.

† Œuvres de Desault par Bichat, tom. ii. pp. 218—220.

slough. Dr. Gibson has found this practice very successful, and prefers it to the seton.*

Efforts have been made to re-establish the obliterated part of the duct, by passing a probe from the fistulous aperture through it, and keeping it open with a seton, or style, introduced into the mouth. Frequently, however, the re-establishment of the original duct is not so easily accomplished, as making a new and more direct channel for the saliva into the mouth. The perforation should be made close to the end of the fistula, and be, as it were, a continuation of it. A seton is then to be employed for keeping it open, while means are taken to heal the fistulous orifice.

When the trocar had been introduced, Desault used to withdraw the stilette, and pass a thread into the mouth through the cannula. This was then taken out, and the seton drawn, by means of the thread, from within the mouth into the wound: but care was taken not to draw it through the external opening, out of which only the single thread passed, and it was fastened to the cheek with a bit of sticking plaster. The outer aperture was now dressed with lint, covered with compresses wet with the *lotio plumbi acetatis*. Thus the external opening had an opportunity of healing, with the exception of a mere point: afterwards, the seton was taken out, and the little aperture touched with the *argentum nitratum*.

During the treatment of these cases, it is necessary that the patient refrain, as much as possible, from masticating or talking, and his food should consist of liquids.†

* *Institutes, &c.* vol. i. p. 155.

† {The method of De Guise, as modified by Beclard, has succeeded when other plans have failed:—the principle consists in establishing a fistulous opening into the mouth, by destroying a portion of the mucous membrane. A leaden wire is passed through two openings made at the bottom of the fistula, and the two ends are twisted so as to destroy the part included between them; the edges of the fistula are to be pared off, and the external wound closed by the twisted suture. }

CHAPTER VI.

THE HARE-LIP

Is for the most part a congenital malformation ; but it is now and then produced by accidental wounds. It is mostly met with in the upper lip, and very seldom in the lower. Sometimes there is only one fissure ; on other occasions, there are two. When, in the latter instance, the intervening substance is sufficiently broad and long, it is best to preserve it in the operation ; but, if narrow and short, it should be cut away. In some cases, the fissure only extends as high as the middle of the lip ; in others, it reaches to the nose, and even into one of the nostrils, which is then much expanded. Besides the fissure in the lip, there is frequently so large a cleft in the upper jaw and palate bones, as to convert the mouth and nose, as it were, into one cavity. Sometimes, there is a fissure in the soft palate, though, for the most part, this is perfect. In certain examples, the jaw-bone, or teeth, project forward into the cleft of the lip.

A hare-lip, besides being a great deformity, is attended with a defect in the speech ; and when the fissure extends along the palate, there is more or less impediment to sucking and swallowing.

In ordinary cases the cure is easy : the surgeon pares off the margin of the fissure, brings the fresh-cut surfaces into contact, and keeps them in this position, until they have grown together.

As infants are very subject to convulsions after operations, many surgeons think it best to defer the cure of a hare-lip till the child is about two years of age.* The youngest subject on which I ever operated was only five months old ; but the case was very successful.

In the operation, the wound should be as clean and regular a cut as possible, in order that it may more certainly unite by adhesion, and of such a shape that the cicatrix may form one narrow line. The margins of the fissure, therefore, ought not to be cut off with scissors, which always produce some degree of contusion.

* See NOTE R.

The handle of a wooden spoon, or a bit of pasteboard, may be placed under the lip, and while this is supported and fixed upon it, the edge of the fissure is to be cut off with a sharp bistoury. Or the lip may be held with a pair of hare-lip forceps, in such a manner, that as much of the edge of the fissure as is to be removed, is situated at the side of the upper blade of the forceps, so that it can be cut off with one sweep of the knife, which will be guided along the instrument, as along a ruler. This is to be done on each side of the cleft, and the two incisions are to meet at an angle above, thus Λ , in order that the whole of the wound may admit of being brought together, and united by the first intention.

As the lips are exceedingly moveable, and it is essential to heal the wound by adhesion, the twisted suture is generally employed for keeping its surfaces in contact. Two silver pins, made with steel points, are introduced through its edges, and a piece of thread is then repeatedly twisted round the ends of the pins, from one side of the division to the other, first transversely, then obliquely, from the right or left end of one pin above, to the end of the lower on the opposite side, &c. Thus the thread, being made to cross as many points of the wound as possible, greatly contributes to maintain its edges in even apposition. It is obvious, that a great deal of exactness is requisite in the introduction of the pins, in order that the edges of the incision may afterwards correctly meet. The pins ought never to extend more deeply, than about two-thirds through the substance of the lip. With the view of preventing too much stress upon them, a compress is to be put over each cheek, and bound forwards with a bandage. The pins should be removed in three or four days; the support of sticking plaster, with the pads and uniting bandage, being then quite sufficient.

Hare-lips are frequently complicated with a fissure in the roof of the mouth. When it is confined to the upper maxillary bones, it generally closes after the operation; but when it reaches along the palate bones and velum pendulum palati, its entire closure takes place with less frequency. Whatever was the form of the division in the palate, the experience of Desault taught him, that if these cases did not invariably admit of complete union,* they at least underwent material improvement, the sides of the fissure becoming in time consi-

* Union has sometimes been accomplished by ingenious modes of applying sutures to the palate; one interesting example of which is recorded in Graefe's Surgical Journal.

derably nearer together. As the complaints, arising from the imperfection of the palate, are also of a very serious nature, the operation should be done at an early period.

Sometimes one upper maxillary bone exceeds the level of the other. When the hare-lip is double, a distinct part of the jaw pushes forward the middle portion of skin. In certain cases, one of the maxillary bones inclines backwards, and its alveolar process juts out. In other examples, an impediment to the union of the hare-lip arises from the projection of a tooth, which must then be extracted.

When the jaw itself projects, the common preliminary step to the operation for the hare-lip, has consisted in cutting away the bony prominence. But, according to Desault, this measure is seldom proper; for when the original congenital deformity is removed, a disfigurement of the face yet follows, from the upper lip having no proper support. The diameter of the upper jaw is also liable to diminish so considerably, in proportion as the two maxillary bones coalesce, that the upper and lower jaws no longer correspond, and the same kind of inconvenient mastication is produced which is often noticed in old people. Hence, Desault preferred reducing the projection of the jaw, by means of the pressure of a tight bandage, which answers every expectation; for, as there is a fissure in the roof of the mouth, the bony prominence has little support, and readily yields. I recommend surgeons to make the necessary pressure with a small spring-truss, which can be much more conveniently applied, and is less irksome than a bandage, as my own experience has taught me.



CHAPTER VII.

CANCEROUS DISEASES OF THE LIP.

WHAT is usually called a cancer of the lip, is met with in various forms; sometimes it has the appearance of an ulcerated, wart-like, excrescence, which occasionally becomes as large as an apple; sometimes it is seen in the form of a very destructive ulcer, which consumes the surrounding substance of the lip: and, in other examples, the disease resembles a hard lump, which at length ulcerates. The disease in its in-

fancy is often a mere pimple, which gradually becomes malignant.

Cancers of the lip are more frequent in men, than women, and generally occur in the lower spheres of life. The upper lip is seldom affected.

Every obstinate hardness and ill-conditioned ulcer on the lips, is not to be regarded as truly cancerous: many cases yield to the remedies mentioned in the chapter on cancer. Keeping the constitution under the influence of either mercury, cicuta, stramonium, or opium, may be tried; but, I believe, generally speaking, that arsenical medicines are the most successful. Many ill-looking, and very obstinate ulcers of the lips, depend on the projection of a sharp rough tooth, the extraction of which is necessary in the treatment.

Whenever the disease is of an unyielding and truly cancerous nature, the sooner it is extirpated the better; and, as the action of caustic cannot be regulated with so much precision as the extent of a wound can be, the knife should be employed.

The operation should be done as for the hare-lip; that is to say, the wound is to be of a shape that will allow its edges to be evenly united. Every portion of the morbid part must also be most carefully removed, lest the disease return. When the affection is extensive, the surgeon is frequently necessitated to remove even the whole of the lip, a great disadvantage, as the patient's saliva can then only be prevented from continually running over his chin, by some artificial mechanical contrivance; the deformity is very great;* and swallowing, and the pronounciation of words, imperfect.

Many surgeons consider the operation unadvisable, when the glands under the jaw are enlarged.

* {In such cases, Messieurs Dupuytren and Richerand remove the whole lip by an incision of a semilunar form, the bleeding vessels are secured by ligatures, and the wound, dressed with charpie, is left to heal by granulation. In this way, says Richerand, little deformity ensues, as the granulations shoot up in such a manner as to cover the teeth, and as it were, a new lip is produced. }

CHAPTER VIII.

DISEASES OF THE ANTRUM.

THE diagnosis of inflammation and suppuration in this cavity, is at first not very clear. A darting pain is felt in the side of the face, extending from the teeth to the orbit, and unattended with any external swelling. The pain and tenderness do not affect the integuments, which may be handled without inconvenience to the patient. The state of the disorder is not attended with much fever, and is usually regarded as a tooth-ach.

In some instances, matter flows into the nose; and, its being discharged from one of the nostrils, excites a suspicion of the nature of the case. But many patients do not distinguish the pus from the usual mucous evacuation; and frequently, in consequence of the communication between the nose and antrum being closed, there is no purulent discharge whatever.

The disease, when further advanced, becomes more obvious. The whole antrum now expands, and its parietes are rendered thinner by absorption. The expansion of the bone towards the nose may produce a complete obstruction of the nostril, or its swelling above may raise the floor of the orbit, and push the eye out of its situation. But the greatest degree of expansion commonly takes place towards the surface of the body; for, all collections of matter have a natural tendency to burst in this direction.

At length, the abscess makes its way through the bony parietes of the antrum, and continues to be discharged through ulcerated openings. In some instances, the matter finds a passage into the mouth, through one of the sockets for the teeth.

Although the diagnosis is generally rendered sufficiently plain by the foregoing train of symptoms, yet writers mention a few exceptions, in which the fistulous external aperture, being situated very remotely from the seat of the disease, as, for instance, behind the ear, no suspicion of the case being an abscess of the antrum would be excited, were it not for the swelling of the cheek, &c.

The most common cause of suppuration in the antrum is a

caries of one or more of the upper grinding teeth. The general causes, however, capable of exciting local inflammation in any situation, may here have the same effect. An obstruction of the opening through which the mucus flows from the antrum into the nose, may create such an accumulation of this secretion as shall occasion suppuration.

The indications in the cure are chiefly two, viz. to procure an outlet for the matter as speedily as possible; and to check the suppuration, and promote the separation of any exfoliations which are taking place.

When there is a carious tooth below the antrum, its extraction is proper; for thus not only a source of great irritation is removed, but frequently a depending opening is at once made into the antrum. When the fang of the tooth does not extend quite into this cavity, the perforation must be completed with a sharp gimlet, or perforator. When all the teeth are sound, the third or fourth grinder is to be selected. The pain and swelling, following the operation, are to be lessened by fomentations; and zinc injections into the sinus may be usefully employed.

Cases present themselves, in which fleshy or bony fungi, or detached portions of dead bone, are situated in the antrum, and in which it is requisite to make a larger opening into this cavity, than can be obtained at its lower part. Instances also occur, in which the patients have lost the grinding teeth, and the sockets are quite obliterated, so that a perforation from below can hardly be effected.

In such cases, practitioners have usually followed the method recommended by Bordenave and Lamorier, and which consists in perforating the malar process of the upper maxillary bone with a small trephine. Another plan was proposed by Desault. After detaching the inside of the cheek from the bone, and exposing the surface of the latter, he drilled a hole into the sinus with a perforator, at the lower part of the fossa canina. The aperture was then enlarged to the requisite extent with the blunt perforator; the corresponding part of the gum was cut away, and a dossil of lint was placed in the opening. For a few days the cheek was covered with an emollient poultice, and, after the removal of the dressings, the cure was completed by the use of gargles and injections. The perforation was kept open a sufficient time, by occasionally introducing the little finger into it.

The detachment of dead portions of bone is altogether the work of nature; and the only way, in which the surgeon can be useful, is to extract, through proper incisions, all exfoliations, as soon as they are known to be loose.

The worst diseases, to which the antrum is liable, are fungous and other tumors growing in its cavity, and producing first an enlargement, and then a destruction of its bony parietes. They frequently produce a complete impediment to the passage of the tears from the eye into the nose; render the eyeball itself motionless, and amaurotic; and ultimately push it entirely out of its socket. The neighbouring teeth also gradually drop out. A sanious fetid matter is discharged from the nostril, the puncta lachrymalia, and even the orbit. The excrescence makes its way through the palate and alveolar processes into the mouth, and, by expanding the bones, completely obstructs the nostril. At last, the swelling protrudes through the cheek, assumes a frightful aspect, and, after attaining this degree, often proves fatal, the patient dying in a comatose state. On dissection, the greater part of the upper maxillary bone is found destroyed, while the fungous mass occupies not only the antrum, but the whole nostril. The caries sometimes extends to the os ethmoides and orbital process of the os frontis, a good deal of the anterior lobe of the brain being also destroyed. Numerous are the unfortunate cases of this description on record,* and in some of them, the want of spirit and judgment in the practitioners consulted in an early stage of the disease, is but too apparent.

The proper treatment is to trephine the antrum as soon as the existence of the disease is known; and to make such a free opening into the cavity, that every atom of the fungus can be conveniently cut out. It is an unfortunate truth, however, that this terrible disease is seldom attacked in the bold and judicious manner advised and practised by the great Desault, who saw more danger in tampering with the case, than in the most decisive measures.

The main object, which this surgeon always had in view, was to remove an adequate portion of bone, so as to allow the distemper to be effectually destroyed at its root. His practice consisted in drilling a hole in the antrum with the perforator, and then cutting away the anterior bony parietes of this sinus with a strong falciform knife, constructed for the purpose; and, if with this instrument he could not remove bone enough, he scrupled not to effect his design by means of a gouge and mallet. Rather than suffer the disease to remain unextirpated, he sometimes broke away part of the alveolar process with the corresponding teeth. As much of the fungus as could

* See Flajani's *Collezione d'Osservazioni e Riflessioni di Chirurgia*, tom. i. p. 95, where three such cases are mentioned.

be cut away was then removed, and the surface from which it grew, was afterwards carefully cauterized. In these cases, Mr. Liston's cutting forceps would be of considerable service, and obviate all necessity for those rough instruments the gouge and mallet.



CHAPTER IX.

FISTULA LACHRYMALIS.*

WHENEVER the tears cannot pass freely through the nasal duct, into the nose, the lachrymal sac becomes distended, so as to form a preternatural tumor, situated just on one side of the root of the nose, below the internal angle of the eye. The contents of the sac, however, are not merely the tears, but also the mucus which the inner membrane of the tarsus and the sac itself naturally secrete. In consequence of this state, the tears cannot freely enter the puncta lachrymalia; and, every now and then, a drop of them falls from the corner of the eye down the cheek. On compressing the space between the eye and the nose, the tumor is for a time diminished, in consequence of its contents regurgitating through the puncta lachrymalia; and also, in some measure, (when the obstruction in the nasal duct is slight,) by reason of their passing down into the nose.

This is the first stage of the disease, absurdly named the *fistula lachrymalis*.

The second stage is, when ulceration has formed in the lachrymal sac an external opening, which is prevented from healing by the contents of the sac continually oozing through it. This state sometimes induces a carious affection of the os unguis, and thus the disease is rendered more complicated. In most instances, the neighbouring eye is more tender than

* Lachrymal parts of the eye. Plate IV. fig. 1.

a. b. The lachrymal sac.

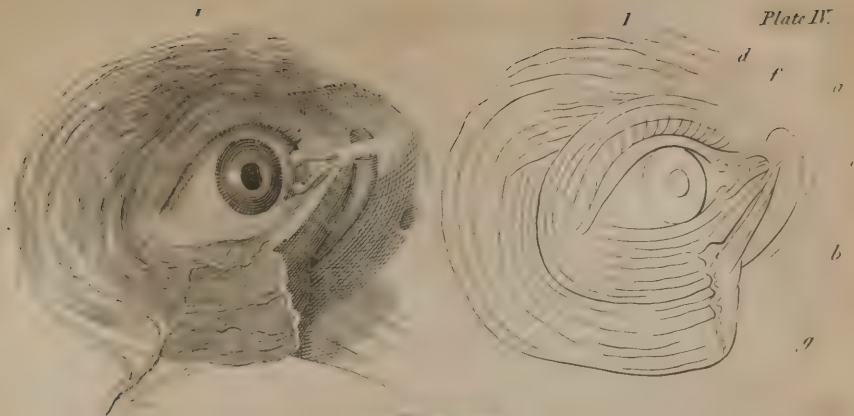
c. The tendon of the *orbicularis palpebrarum* muscle.

d. Punctum lachrymale superius.

e. Punctum lachrymale inferius.

f. Caruncula lachrymalis.

g. Portion of the orbicular muscle reflected from the surface of the lachrymal sac.



in the healthy state, and, in some, it is always more or less inflamed.

Scarpa asserts, that the chief part of the yellow viscid matter, which accumulates in the lachrymal sac, is secreted by the lining of the eyelids, and by the little glands of Meibomius, and that the altered quality of this secretion has a principal share in the cause of the disease. On the other hand, Mr. Travers considers this doctrine as hypothetical, for various reasons, and, amongst others, because, if it were founded on fact, it would be present in every severe lippitudo, or ophthalmia with purulent discharge, which is not the case.*

TREATMENT.

When the tears occasionally trickle over the cheek, in consequence of relaxation of the lachrymal points and canals, after inflammation of the eye, the disease is named by Schmidt and Beer, *stillicidium lachrymarum*, which is easy of cure, the infirmity often ceasing of itself at the approach of warm, dry weather; and when surgical aid is required, it readily yields to astrigent collyria. These are to be dropped out of a quill several times a day into the eye, the patient lying down upon his back at the time, and for some minutes afterwards, in order that the operation of the remedy may not be immediately stopped.† When the case depends upon the mere obstruction of the puncta, the introduction of a small silver probe, through them into the sac, once or oftener, as may be required, is alleged to be capable of effecting a cure; but a complete obliteration of these orifices is incurable.‡ With regard to the epiphora, which depends upon an augmented secretion of tears, and originates from irritability of the eye and its appendages, remaining after ophthalmia, Beer describes the complaint as generally so easy of cure, that it will subside if the patient merely keep himself in a pure, dry, and if possible, warm air; and moderately exercise his eye, especially upon varying objects, &c. But in unhealthy, irritable subjects, when the disorder is more obstinate, he enjoins, with the preceding plan, attention to diet, and the use of astrigent collyria, the most effectual of which he says is composed of a solution of nitrate of silver, with a proportion of the acetate of lead and thebaic tincture. He also recommends

* Synopsis of the Diseases of the Eye, p. 360.

† Lehre von den Augenkrankheiten, 2ter B. p. 46.

‡ Travers's Synopsis, p. 366.

the eyelids to be rubbed with the spiritus aromaticus, or a mixture of cau de Cologne and tincture of opium.*

The first stage of the fistula lachrymalis, sometimes named in this country *epiphora*, and by Scarpa called the *purulent palpebral discharge*, may frequently be cured by very simple means. I shall not enter into the question, whether the morbid state of the Meibomian glands, and of the internal membrane of the eyelids, is the cause, or only an effect, of the obstruction in the ductus nasalis. I think the discussion of this point quite superfluous; for, whether it be one or the other, it is proper to follow the same practice, namely, to make such applications to the inside of the eyelids, as have a tendency to improve the quality of the secretion from them, and to endeavour to restore the free passage of the tears into the nose.

While the lachrymal sac is entire, that is, while the disease is not in an advanced state, the most judicious plan is to inject warm water, at least once every day, into the lachrymal sac, through the lower punctum lachrymale, by means of Anel's syringe, with the view of mechanically washing away any thickened mucus, or other matter, obstructing the nasal duct. If there be marks of inflammation in the situation of the sac, leeches may be applied.

At the same time, the patient should employ a collyrium, composed of five grains of the sulphate of zinc dissolved in four ounces of aq. ros.; or he should introduce upon the point of a blunt probe, every morning and evening, between the eyelids and eyeball, a small quantity of the ung. hydrarg. nitrat. mitius.

Perseverance in this treatment, for two or three weeks, will often effect a complete cure. When it does not, and there is no ulcerated opening already, the sac should be punctured, and the duct simply examined with a fine probe: if the probe pass without resistance into the nose, the case (as Mr. Travers correctly remarks) requires no further operative treatment; the integument recovers its healthy condition under an emollient application, the discharge gradually diminishes, and the wound heals. If, on the other hand, upon examination with the probe, resistance is offered to its passage into the nose, a better opportunity will not be had to overcome such resistance. This should therefore be accomplished, and the wound afterwards suffered to heal, without further disturbance.† I consider, that the mild, unirritating treatment, here adopted by Mr.

* Travers's Synopsis, p. 45.

† Synopsis, &c. p. 364.

Travers, in preference to that of keeping an extraneous substance in the duct for several weeks, in every respect judicious. However, when the passage of the probe is so firmly resisted, that a good deal of force is necessary to get it down into the nose, some measure is afterwards indispensable to prevent the newly-opened duct from closing again. For this purpose, Mr. Travers introduces a small silver probe, from either of the puncta lachrymalia down the nasal duct into the nostril. Many recent cases, in which the structure is not very firm, he says, are completely cured by the passage of the instrument three or four times, at intervals of one or two days. When the case is not cured by this method, he introduces a style through the punctum into the nose, and leaves it in the duct twenty-four hours. A day, or two, are suffered to elapse, before the style is introduced again, which is done through the other punctum. On the intervening days, tepid water is injected with Anel's syringe. Whenever the water flows into the throat in a full stream, the further use of the probe is unnecessary; but, if the tears and mucus should not readily pass into the nose, astringent lotions may be injected, and the vapour of vinegar, or of diluted nitric acid, inhaled up the nostril.* The silver style, employed by the late Mr. Ware, (Plate 4. figs. 2. and 3.) has a flat head, like that of a nail, only placed obliquely, in order that when it is situated in the duct, the top may lie in close contact with the skin covering the sac. For an adult, it should be about an inch and a quarter, or an inch and three-eighths in length. A small puncture is made in the sac, when there is no external opening, or this is unfavourably situated. A small probe is now introduced down the lachrymal sac and nasal duct into the nose. The passage is then kept from closing by putting the style into it, and leaving it there. It is to be withdrawn and cleaned twice a week, and warm water injected through the external opening down into the nose. At the end of six weeks, the style may in general be left off, and the aperture healed.

Surgery, I consider to have been truly improved by Mr. Travers's observations on the former officiousness with styles, the keeping of which in the nasal duct for several weeks, can, indeed, be rarely proper. The occasional passage of a small probe is certainly better practice; but, for fear of doing permanent injury to the lachrymal puncta and canals, I should prefer introducing the instrument through a small puncture in the skin and sac.

* Travers's Synopsis, p. 375.

When the os unguis is carious, it may sometimes be proper to make a larger opening into the sac, in order to remove any tedious exfoliations. But, now that the practice of cramming the sac with tents, escharotics, &c. has given place to the mild methods above explained, disease of the bone is found to be a rare occurrence. The perforation of the os unguis, for a new passage into the nose, I think, with Mr. Travers,* can hardly ever be so judicious a plan, as that of restoring the natural channel, or of forming one as nearly as possible in the same direction.



CHAPTER X.

DISEASES OF THE EYELIDS.

INFLAMMATION OF THE LINING AND MARGINS OF THE EYELIDS.

IN this section, are comprised the cases, to which the terms *catarrhal inflammation of the eyelids*, *psorophthalmia*, and *lippitudo*, are applied; the two latter, however, only to certain stages of the disease. According to Mr. Lawrence, catarrhal inflammation of the eyelids begins with soreness, smarting, burning, and dryness of their margins, which become red, swelled, and painful. The palpebral conjunctiva is at the same time red, and perhaps villous. As the motions of the eye create great uneasiness, with a sense of stiffness or dryness, the eyelids in an acute attack are kept shut and quiet. Reading and writing, particularly before the fire, bring on pain. A mucous discharge soon takes place from the inflamed membrane, and the pain is then succeeded by itching, (*psorophthalmia*.) The Meibomian glands participate in the affection, which begins on the ciliary margin of the eyelids. They no longer pour out the mild unctuous matter, which usually softens the edges of the eyelid, but their secretion is suspended, so that, in the morning, these edges are rendered adherent by the increased conjunctival discharge, which has become incruusted by the evaporation of its watery part during the night. Thus the eyelids are often so firmly agglutinated together, as to require

* Travers's Synopsis, p. 372.

long bathing with warm water before they can be parted. When the Meibomian secretion is renewed, its viscosity is increased, and consequently it assists in gluing the lid together, while its diffusion over the cornea affects its polish, impairs vision, and leads the patient to ask for something to clear it. Hence frequent attempts to clear the cornea by moving the eyelids; and hence, when vision becomes worse in the evening exacerbation of the symptoms, rings, haloes, and irides are seen round the candle, or its flame splits into stars. At the same time, the uneasiness, smarting, or itching, the stiffness, redness, and mucous secretion, are increased. The ciliary margins become raw. The eyelids, particularly towards their angles, and the lower eyelid more especially, are irritated by the nature of the discharge, excoriated, and even ulcerated. This, which is the chronic form of the complaint, and called *lippitudo*, often lasts for many weeks, months, or years; recurring on the application of slight causes, whether external or internal; often originating insensibly, and advancing slowly, without any marked acute stage; leading to thickening of the eyelids, especially of the mucous lining of the lower one, and consequent ectropium of that lid, and loss of the cilia.

The causes of this disorder are referred by Mr. Lawrence to atmospherical influence, exposure of the eyes to cold and wet weather; residence in close smoky apartments; and employment of the eye by candlelight, &c. The operation of these causes, he says, is increased by neglect of cleanliness, indulgence in fermented liquors, and inattention to the state of the bowels.

In the acute or incipient stage, Mr. Lawrence recommends the application of leeches to the eyelids, tepid lotions, mild ointments, and active aperients, and afterwards alteratives and gentle purgatives. The taking of blood from the temples by cupping may sometimes be necessary, and the repetition of leeches is frequently so. Blisters may afterwards be used. The organ must be rested, and the exciting causes removed. In the chronic stage, Mr. Lawrence employs astringents and stimulants, and free scarification of the inside of the eyelid. The *vinum opii* and metallic salts in solution may be used; but the *unguentum hydrargyri nitrati*, or the red precipitate ointment, weakened with an equal quantity or two thirds of *ung. cetacci*, is preferred. It is to be applied with a camel-hair pencil to excoriated edges of the eyelids, which should be previously freed from all incrustations, after they have been duly softened with tepid water.

The disease is sometimes rendered obstinate by complication with a scrofulous constitution, in which circumstance, al-

terative medicine, the warm bath, the flesh brush, regular exercise, warm clothing, and blisters kept open behind the ears, may be tried.

GRANULAR CONJUNCTIVA,

Is mostly an effect of severe purulent ophthalmia, and consists of a rough, hard, granulated state of the lining of the eyelid, attended with a thin or puriform discharge; a varicose affection of the vessels of the sclerotic conjunctiva; a nebulous appearance of the cornea; a sensation as if sand were lodged under the eyelids; great tenderness of the organ, and inability to bear the light; and an incessant epiphora.

In recent cases, the cure may be obtained by applying leeches to the vicinity of the eye, and putting on the diseased part of the lining of the eyelid, once or twice a day, with a camel-hair pencil, a little of the ung. hydrarg. nitrat. When this application fails, the sulphate of copper, or nitrate of silver, may be applied; and for this purpose, as Mr. Welbank has rightly observed, the eyelids should always be completely everted, as there is sometimes at the angle, where the conjunctiva passes from the globe to the lid, a semilunar fringed fold, not unlike a cock's comb,* which might otherwise not be discovered. After the use of caustics, the part must always be well washed with tepid water, before being returned into its natural position. When the granular productions are hard, callous, and pendulous, some writers prefer excision to caustic.†

CONCRETIONS OF THE EYELIDS,

Are of two kinds; one, termed *symblepharon*, in which the lining of one or both eyelids adheres to the eyeball; the other named *anchyloblepharon*, in which the two eyelids adhere at their edges. The two states frequently exist together.

The last form of the complaint is sometimes, though rarely, an original malformation. It is most frequently produced after birth by violent ophthalmies, burns, &c. When the edges of the eyelids have grown together, the preternatural connexion is to be divided with a bistoury, care being taken

* See Frick on Diseases of the Eye, p. 240, note.

† {The treatment recommended by Sir William Adams, of completely everting the lids and removing the granulations by the knife, we consider as infinitely preferable to the use of caustics:—we have seen irreparable injury to the cornea produced by the application of strong caustics for the purpose of removing the granulations. }

not to wound the eyeball. The cut surfaces are then to be kept asunder by the interposition of lint dipped in sweet oil, or by supporting the upper eyelid with a strip of court plaster, until they have healed. When the edges of the eyelids have grown together, from the outer to the inner canthus of the eye, it is of no use to separate them, if the cornea be known to be perfectly opaque. It is only when the adhesions between the eyelids and eyeball are loose, limited to a small extent, and not situated over the cornea, that it is very practicable to do good by an operation.

ECTROPIUM.

A turning out of the eyelids is so named. The lower one is most frequently affected, its edge falling downwards and forwards away from the eyeball, which is no longer duly covered and protected.* The exposure of the lower portion of the eye, and of the conjunctiva of the eyelid, produces in these parts a species of chronic inflammation, attended with constant pain, and redness, and thickening of the membrane, which is at length converted into a hard callous substance, lying just under the globe. As the flow of tears towards the inner angle, and through the puncta lachrymalia, is obstructed, they fall over the cheek, which is sometimes excoriated.

One of the most common causes of this disorder is a contraction of the integuments of the eyelid, or neighbouring part of the face, after the cicatrization of burns, ulcers, and wounds.

In this case, dividing the contracted skin will not give permanent relief, as the new granulations will be absorbed, and the usual contraction again follow cicatrization. The difficulty of curing this form of ectropium led Sir W. Adams to cut out a triangular portion of the tarsus, and then unite the divided parts with a suture, by which means the deformity and all its inconveniences were materially lessened. Another plan, which I should generally prefer to this, is the removal of a considerable portion of the thickened lining of the eyelid, with a convex bistoury, and a pair of dissecting forceps. Afterwards, in proportion as the wound heals, the eyelid, with the aid of a compress and bandage, returns to its natural position. Care must be taken not to cut the puncta lachrymalia. The eyelid is drawn inward again by the same prin-

* Plate 4, fig. 4.

ciple which caused its eversion, viz. the contraction of the cicatrix.*

Another species of ectropium, mostly met with in old persons, and arising from relaxation and swelling of the conjunctiva, and a fungous thickened state of the lining of the eyelid, if not in a bad degree, may be cured by turning the eyelid completely out, and rubbing the argentum nitratum along its fungous surface, until a slough is produced. The eyelid must be everted until the caustic has been washed off the slough, and the part smeared with oil. Applications, calculated to remove the relaxed state of the conjunctiva, and a compress and bandage for the support of the eyelid, will complete the cure. A slight, recent ectropium, caused by purulent ophthalmia, will generally yield to mild astringents. When the lining of the eyelid is quite hard and callous, its excision should be preferred.

TRICHIASIS,

Is of two descriptions; in the first there is no defect of the eyelid, and the whole grievance depends entirely on the wrong direction in which the eyelashes grow; in the other, the defect lies altogether in the eyelid itself, the margin of which turns towards the eye, so that the cilia rub against the front of this organ, and produce considerable inconvenience. The latter case, which is by far the most common, is termed *entropium*.

When the upper eyelid is inverted in the slightest degree, a distressing irritation of the eye is occasioned; but when a large portion of the lid is inverted, the case becomes truly afflicting. The friction of the cilia against the eye is incessant, and from the continual suffering, the patient's health and strength decline. The cornea ulcerates and becomes opaque, and the sight is ultimately destroyed. Nor is this the end of the patient's misery, unless the cornea become thickened and indurated in an extraordinary degree, assuming a white appearance, like that of a macerated ligament, in which case, the patient finds ease in the insensibility of this new-formed substance.

The appearance of the disease, in its inveterate form, is truly disagreeable. The discharge, the copious flow of tears, the excoriation of the cheek, the opacity of the cornea, the villous, granular, or fungous conjunctiva, compose altogether

* Plate 4, fig. 5.

a disgusting sight. The patient carries his head obliquely, and attempts, in the most awkward manner, to direct the pupil towards the object which he wants to see; indeed, when the upper eyelid is inverted, the patient, in order to avoid turning up the eye, distorts his head, and seems as if he had a wry-neck.*

The usual cause of the distorted position of the cilia is cicatrices near the edges of the eyelids, after strumous ophthalmia, inveterate and neglected cases of psorophthalmia, &c. In consequence of inflammation or ulceration, the hairs fall off, and when they grow again, they shoot in a wrong direction. Trichiasis, if not relieved, generally destroys the sight, for the friction and pressure of the hairs against the eye, occasion severe pain, constant inflammation, and, at length, ulcers, and complete opacities of the cornea.

The cure of the first description of trichiasis consists in plucking out the inverted hairs, and preventing their reproduction in the same direction, by smearing the whole inner half of the margin of the eyelid, by means of a camel-hair brush, with the liq. ammon.; or a solution of the argentum nitratum; or else by removing a piece of the skin, containing the roots of the inverted cilia, as proposed by Mr. Saunders.

The second kind of case, called entropium, is the most frequent. In the upper eyelid, the defect may be owing to a relaxed state of the levator muscle, or integuments of the part, in which circumstance, it may sometimes be cured by supporting the eyelid, for a certain time, with sticking plaster; but if this plan fails, a cure may generally be accomplished by cutting away a fold of the integuments near the edge of the tarsus. This should be done exactly in the middle of the inverted part, and the best instruments for the purpose are a pair of curved scissors, and the forceps invented by Bartisch. The wound is then to be closed with sticking plaster, compresses, and a bandage.† In proportion as the contraction of the cicatrix follows, the tarsus is restored to its right position.

Another ingenious treatment is that of producing a contraction of the skin of the eyelid, by means of strong sulphuric acid, which is to be applied by means of a piece of smooth solid wood to the centre of the affected part of the lid, and

* See Saunders's Treatise on some Pract. Points relating to Diseases of the Eye, &c. pp. 45—48.

† See Scarpa's Osservaz., &c., sulle Principali Malattie degli Occhi, pp. 76—78. edit. 8vo.

rubbed along on an oval space, a little longer than the extent of the inversion of the hairs, and from three to six lines in width, according to the inveteracy of the disease. After the acid has been applied about ten seconds, the part is to be dried. In general, three or four applications in this manner will bring the hairs into their natural position.*

More difficult cases, however, are met with, arising from an alteration in the shape of the cartilage of the eyelid. For these the common plans will not suffice. In one example of this kind, Dr. Crampton effected a cure by making two perpendicular incisions in the broad margin of the tarsus, at the sides of the inverted hairs, and then making a transverse cut through the lining of the eyelid, from the extremity of one of the first wounds to that of the other. The inverted portion of cartilage, within the incisions, was then put into its right position, and retained so with sticking plaster.†

In very bad cases, in which Mr. Saunders conceived the vicious shape of the tarsus made the restoration of its natural position totally impracticable, he performed its excision; but the operation, which is severe, and apt to leave disfigurement, is not in general considered so eligible as that suggested by Crampton.

Other plans of relieving entropium have been proposed; but the preceding seem to be those which deserve notice in an elementary work.

If an inversion of the lower eyelid were to proceed from the orbital edge of the tarsus being pushed out by an encysted tumor, or by a chronic thickening of the conjunctiva, the removal of the tumor, or thickened membrane, and the use of a compress to keep the orbital edge of the tarsus inwards, would effect a cure.

PTOSIS.

This disease consists in an inability of properly raising the upper eyelid. Three varieties are noticed: the first depends on a preternatural elongation of the skin of the upper eyelid; the second, on weakness or total paralysis of the levator muscle; and the third, on a spasmodic contraction of the orbicularis palpebrarum.

The first example is the most frequent, and is cured by the removal of the redundant integuments of the eyelid.

* See Guthrie's *Operative Surgery of the Eye*, p. 30.

† *Essay on Entropion*, p. 55.

The second species is principally met with in old persons, in whom the cure is often impracticable. It is sometimes symptomatic of hydrocephalus, and apoplexy, injuries of the head, chlorosis, worms, &c., while in other examples it is entirely a local defect.

The chief means of cure are, bathing the eyelid and forehead with cold water; the shower bath; friction with camphorated mercurial ointment, or liniments, strengthened with the tincture of cantharides; electricity; an issue between the mastoid process and angle of the jaw; the exhibition of bark and other tonics. But, in every instance, the cure will depend upon the possibility of removing the original disease, of which the paralysis of the eyelid is an effect.

Ptosis from a spasmodic affection of the orbicularis muscle is the least frequent, is never continual, but makes its attacks at certain or uncertain periods, and its duration varies in different cases.

The spasmodic ptosis is sometimes an effect of epilepsy, hysteria, worms, &c., in which cases the treatment should be directed to the original complaint. As a general observation, it may be said, that the affection of the eyelid requires aperient medicines, antispasmodics, blisters behind the ears, and bathing the eye with a warm decoction of poppy-heads.

HORDEOLUM, OR STYE,

Is always situated at the edge of the eyelids. It is a very small circumscribed tumor, about the size of a barleycorn. An inflamed stye is extremely red and painful; and is very similar, in every respect, to a small boil.

The cure of an inflamed stye demands the external employment of emollient applications; for the tumor always suppurates, and the more this is promoted, the sooner is the patient freed from inconvenience. Even when the stye has already suppurated, emollients are the best applications, until the hardness has subsided. When the suppuration has terminated, a weak solution of the acetate of lead may be used to disperse the remaining redness and swelling.

The *indurated* stye, as it is called, occasions a good deal of inconvenience, by frequently inflaming and becoming painful, hindering the motion of the eyelids, and preventing the free enjoyment of sight. The best mode of curing this disease, is to touch the little induration with the *argentum nitratum*, until it is destroyed.

ENCYSTED TUMORS OF THE EYELIDS.

These are most frequently situated immediately under the skin, but sometimes they lie so deeply, that they can be taken out more easily from the inside, than the outside of the part. They seldom become very large, and are more commonly observed on the upper than the lower eyelid. When they have attained a certain size, they hinder the elevation of the eyelid, and occasion ptosis. They can only be safely extirpated with a cutting instrument.

Scarpa is an advocate for removing the generality of them, by making the incision through the lining of the eyelid, which practice is decidedly right when the tumor is deep-seated within the eyelid, or beneath the orbicularis and levator muscles. Care must be taken not to cut the tendon of the trochlearis. However, if the tumor be on the outside of the cartilage of the eyelid, the wound should generally be made through the integuments.



CHAPTER XI.

OPHTHALMY, OR INFLAMMATION OF THE EYE.*

OF all the disorders of the eye, inflammation is the most frequent; and there are few diseases of this organ, with which it is not sometimes connected, either as cause or effect. It has only been of late years, however, that its various forms have been well discriminated; for ophthalmy was a term applied to all inflammations of the eye, whether the eyelids, the conjunctiva, the sclerotica, the iris, or the retina, were the structure chiefly concerned; and although the epithets *mild* and *severe*, *dry* and *humid*, *external* and *internal*, were frequently used, the more valuable distinctions deducible from the structure principally affected in different examples, and the characteristic symptoms of each variety, were altogether over-

* For some valuable observations in this chapter, I am indebted to Mr. Lawrence's Lectures.

looked. As my friend Mr. Lawrence has observed in his excellent lectures, inflammation of the eye generally commences in one structure, to which it is at first restricted, and beyond which, if it be rightly treated, it does not usually extend. But, if it be neglected, or wrongly treated, it soon exceeds its original limits, and, perhaps, ultimately invades the whole organ.

Inflammation of the whole eye-ball, or common inflammation, seated both in its external and internal structures, when fully developed, is characterized by very considerable pain, increased external redness, more or less swelling of the whole organ, an augmented secretion from the lachrymal gland, and redness and swelling of the upper eyelid. The pain is not confined to the forepart of the eye, but is deep-seated, and extends to the eyebrow, cheek, temple, and back of the head. In the commencement, the redness is inconsiderable, and chiefly in the vessels of the sclerotic coat; but the conjunctiva very quickly participates in the inflammation, and the distention of its vessels produces the bright scarlet colour, which conceals the fainter pink tint of the sclerotica. The conjunctiva then begins to swell, and a deposition of coagulating lymph (not blood, as is commonly stated) takes place, not only in the texture of the membrane, but in the loose cellular tissue which unites it to the sclerotica: this very red, circular projection, or the conjunctiva round the cornea, giving the latter membrane a sunk appearance, and even sometimes partly concealing it, has long been known under the name of *CHEMOSIS*. Light is very offensive; so that the pupil contracts to exclude it; and the eyelids are spasmodically closed. As all motion of the organ gives pain, the patient keeps it as much as possible at rest. In the beginning, the organ is rather stiff and dry, but this state goes off, and is succeeded by a copious lachrymal discharge, which is much increased if the eye be exposed to the light, or any external irritation.

In a more advanced stage, various changes of structure are observable. The colour of the iris is altered, its brilliancy disappears, and its usual motions in different degrees of light are interrupted. The pupil diminishes, and loses its clear black colour. The cornea becomes more or less opaque, and vision is lost, sometimes from this cause, and the closure of the pupil; sometimes from injury of the retina, as when sight is destroyed, though the cornea and pupil do not completely obstruct the light; and, frequently, from all these circumstances together.

Although the internal parts of the eye, generally, cannot be

seen to be inflamed, no doubt can be entertained of the fact, when it is considered that the eyeball is actually increased in size, the structure of the iris changed, and the sensibility of the retina lost.

The thickened eyelids protrude; ectropium of the lower one takes place; and a portion of the front of the eye projects, like a piece of red flesh.

So violent an affection of a vascular and sensible organ, situated in the immediate vicinity of the brain, necessarily produces a great deal of constitutional sympathy, or inflammatory fever.

If the case be not checked, the pain becomes throbbing, rigors occur, and suppuration of the eyeball takes place, the cornea assuming first a dull white, and then a yellow colour. No relief is experienced until the cornea bursts, and the collected matter is voided, with which the vitreous humour, and crystalline lens, usually escape. The eye then shrinks into the orbit, its original form being completely destroyed. When the disease does not proceed quite so far, the patient escapes with opacity of the cornea, and a closed pupil, vision being either lost, or seriously impaired, but the natural figure of the organ continuing. Even in the most favourable terminations, when the cornea is clear and the pupil open, the retina has generally suffered so much, that vision remains more or less imperfect.

No hope can be entertained of preventing change of structure in the organ, and consequent loss of sight, unless the case be actively treated in its early stage.

When chemosis is formed, the cornea cloudy, the colour of the iris changed, and the pupil contracted, the patient is likely to lose his sight.*

Inflammation of the external proper coats of the eye varies considerably in degree, from a slight affection of the conjunctiva, to acute inflammation of it, with chemosis, and similar inflammation of the sclerotica and cornea. In simple inflammation of the conjunctiva, there is little pain or inconvenience, and no danger to the organ; but the firmer textures of the sclerotica yield to distention, only slowly and painfully, and their vessels do not easily recover, so that inflammation is more difficultly subdued; while the implication of the cornea, and the ready transition of inflammation to the iris, expose the organ to serious danger.

Inflammation of the external proper tunics of the eye is attended with outward redness, pain, intolerance of light,

* See Lawrence's Lectures on Diseases of the Eye.

increased lachrymal discharge, and more or less febrile disturbance. The external redness begins on the front of the globe, immediately round the cornea, where it forms a red zone, to which numerous vessels tend over the sclerotica from the back of the eyeball. In inflammation of the conjunctiva, the redness begins at the circumference of the organ, its anterior part being comparatively free from it, and the sclerotica retaining its natural white appearance. The discharge is also of a mucous nature. The character of the red tint differs remarkably in the two cases. The vessels distended in sclerotic inflammation, being seen through the conjunctiva, have a dark-red rose or lively carmine appearance,* which forms a striking contrast to the bright scarlet tint of the vessels distended in conjunctival inflammation. The vessels of the sclerotica always follow the motion of the eye, a circumstance peculiarly characteristic; those of the conjunctiva, on the other hand, are capable of being moved without any motion of the eyeball itself.† The conjunctiva soon participates in the affection; the cornea looks dull; it is not actually opaque, but its polish is impaired. A stiffness and dryness of the eye, with a sort of burning or aching pain, tension, and pressure, or an uneasiness, similar to what would be produced by sand or gravel in the eye, is felt; and as the disorder increases, the pain grows more severe, and extends to the back of the head, and nearest temple. Intolerance of light is a strongly marked symptom of inflammation of the sclerotica; and forms another striking contrast between this affection and conjunctival inflammation; for, in the latter, the patient generally opens his eye freely, and experiences no pain from the access of light.

In violent cases of inflammation of the outer proper coats of the eye, chemosis takes place, and the cornea loses its bright polished appearance, and turns greyish. The eyelids are also affected, their conjunctival lining becoming red and inflamed. Although the eye feels dry and stiff at the commencement of the case, the lachrymal secretion is soon restored, and even augmented, so that whenever the eye is opened, there is a copious flow of irritating tears.

When the disorder becomes still worse, the cornea first turns greyish, and, on the occurrence of chemosis, white, cloudy, and, lastly, yellow, as if pus were deposited in its texture. The yellow substance, however, is not fluid; neither does it make its way to the surface like pus; but the cornea

* Frick on Diseases of the Eye. New edition, p. 59. Lond. 1826.

† R. Welbank, Op. cit. p. 14.

ulcerates, and the deposited matter is removed by ulceration. A similar deposition may take place in the anterior chamber, producing what is termed *hypopyum*. When the cornea is affected in this manner generally, the ulceration commonly extends into the anterior chamber at several points; the aqueous humour escapes, and the iris comes in contact with the inflamed and ulcerated cornea, and is often protruded in one or more places. When the inflammation subsides, the cornea is left opaque, the iris adherent to it, the anterior chamber is abolished, and vision irrecoverably destroyed. If matter be deposited only at one point of the cornea, ulceration may be stopped by active treatment, the cornea nearly regain its natural appearance, and vision be restored entirely, or with little defect.

The degree of danger will depend on the state of the cornea; when this is not affected, or but slightly, there is no danger. If there be chemosis, and the cornea be grey, or white, or if a yellow deposition has taken place in its texture, followed by ulceration, &c. sight will be more or less impaired.

Causes of inflammation of the eye.—Wounds, and other kinds of external violence; the irritation of extraneous substances lodged under the eyelids; immoderate exertion of the organ, particularly in viewing minute shining objects, and in hard study by candlelight; exposure of the eye to a glare of light reflected from the sea, or a snowy, sandy, or chalky country; the sudden impression of a flash of lightning; and certain states of the atmosphere. Mechanical and chemical injuries of the eye necessarily produce more or less inflammation in all individuals; but atmospherical influence, a redundancy of light, and great exertion of the organ, will not excite the complaint in every person. Besides these latter exciting causes, therefore, some predisposing state of the part or constitution must exist, without which the eye will not be inflamed by them. In the list of predisposing circumstances, writers mention fulness of habit, or plethora; a disordered state of the digestive organs; intemperance, producing an increased circulation, and an augmented distribution of blood to the head and eyes; the cessation of habitual discharges; sedentary occupations; and costiveness.

Treatment.—The first duty is to remove, if possible, the cause of the inflammation of the eye, as may be accomplished when extraneous substances are in contact with the organ. The eye should first be examined in a good light, and, if nothing be discovered on it, the lower eyelid should be depressed, and the inferior portion of the globe brought into view by the patient's looking upward. If no particle of extraneous

matter can be detected in this way, the patient should turn the eyeball downward, and the upper eyelid be raised, so that the upper portion of the globe may be seen. In most cases, the extraneous body lodges in the concavity of the upper eyelid, which is then to be everted. The eyelashes are first to be taken hold of, and the eyelid drawn downwards, and while steady pressure is made against its upper part, its ciliary margin is to be carried upwards and backwards. When small particles of metal stick in the cornea, they should be removed with the point of a cataract needle. In bad cases, the eye must remain perfectly at rest in a darkened room; and even in slight ones, reading, writing, &c. should be discontinued, though the eye need not be kept in the dark, or covered up. As soon as the patient can bear a moderate light, without inconvenience, it is an excellent rule to remove all coverings from the eye, except a green shade, and admit every day into his chamber a brighter light; so that he may be habituated, as quickly as possible, to the open day-light; for nothing has a greater tendency to prolong an irritable, weak state of the organ, than keeping it long in a dark situation, and unexposed to the air.

Bleeding is the chief means of subduing the above-described forms of ophthalmic inflammation. The blood should be taken from the arm, and, in severe cases, the quantity taken away should be sufficient to induce faintness, when the disorder will receive an immediate and decided check. This practice is necessary in inflammations affecting the whole eyeball, in those which attack the external proper tunics of both eyes, or are violent in the same tunics of only one of them.

The next most efficacious method of taking away blood, Mr. Lawrence finds to be cupping, either on the back of the neck or temple; which he deems more certain and convenient, than opening the temporal artery or jugular vein. To the latter situation, however, he gives the preference, because some branches of the temporal artery are commonly wounded, from which an adequate quantity can always be readily obtained. In severe cases, the repetition of venesection is sometimes necessary, but cupping still more frequently. Leeches are useful, and may be put either on the eyelids, the temple, eyebrow, or just below the inner commissure. On the eyelids, however, they often produce a kind of ecchymosis, on which account, some practitioners apply them to other parts near the eye. Scarifying the conjunctiva, a plan formerly in common use, is condemned by Mr. Lawrence in every instance of active inflammation, as more likely to do harm than good; a sentiment in which I fully coincide.

In addition to bleeding, every other part of the antiphlogistic system will be requisite, as low diet, and purging with calomel, combined with rhubarb, extract of colocynth, or jalap, or followed by infusion of senna, salts, and manna. Saline medicine, with antimony, or nitre, is afterwards to be given to promote perspiration, and keep the bowels regular.

After evacuations, blisters may be applied to the back of the neck, or behind the ear; but, when the inflammation is active, not nearer to the affected organ; a valuable remark, particularly insisted upon by my friend Dr. Vetch.

With respect to topical applications in acute ophthalmy, their efficacy is certainly inferior to that of bleeding, and the rest of the foregoing measures; but, it is customary to employ them. I am of opinion, however, with my friend Mr. Lawrence, that a poultice is an inconvenient application to the eye, and, perhaps, generally more hurtful by its pressure, and its total exclusion of the light and air, than truly useful. In the very acute stage of ophthalmy, therefore, a tepid collyrium, composed of about five grains of the sulphate of zinc, or acetate of lead, dissolved in four or six ounces of rose-water, may be used in an eye-cup; and, if the case be very severe, and attended with violent head-ach, a strong decoction of poppy-heads may be employed as a fomentation. In proportion as the irritability of the eye diminishes, the warmth of the collyrium should be gradually lessened, until it can be borne quite cold. When the acute form of the complaint has completely subsided, the cure may often be accelerated by introducing between the eye and eyelids, once or twice a day, two or three drops of the vinous tincture of opium. The premature employment of this application, however, while great tenderness of the organ and aversion to light exist, is never advantageous; nor is it in any circumstances superiorly useful to other stimulating fluids of the same degree of strength.

With the view of relieving severe acute ophthalmy, and preventing opacity of the cornea, when the case is attended with a sense of distention in the eye, and cloudiness of the cornea, Mr. Wardrop sometimes makes a small puncture in the anterior chamber, and lets out the aqueous humour; a proceeding which he also recommends when there is the smallest quantity of pus in the same chamber, attended with inflammation. Various opinions are entertained of the usefulness of this practice; but it is certainly one that is not at present very commonly followed. Neither is the treatment with nauseating and purgative doses of tartarized antimony much adopted, a plan so highly commended by Scarpa. When, in severe cases, a yellow substance is effused in the anterior

chamber, the quick exhibition of mercury, as well as the continuance of antiphlogistic remedies, is urgently necessary.

When inflammation of the proper coats of the eye has attained its chronic stage, or, according to Mr. Lawrence's view of the subject, when its degree has lessened, the question is, whether an attempt should be made to restore the tone of the organ by astringent applications, tonic medicines, liniments to the eyelids and eyebrow, and the vapour of the spiritus ammon. comp. to the eye itself, assisted with a strengthening diet, good air, and gentle exercise; or whether the continued use of cupping and leeches, and the insertion of a seton in the temple, with a regimen and medicines adapted to the particular state of the constitution, will answer best? This is a point, on which high authorities differ.

Inflammation of the conjunctiva presents itself either in a mild or severe form: the first case is named by Beer, *catarrhal ophthalmia*; the second comprises all the varieties of *purulent ophthalmia*, as it is customarily called in this country. *Catarrhal ophthalmia* generally commenced with stiffness and smarting, or a sensation as if sand had got into the eye, some uneasiness on exposure to light, a watery state of the eye, and external redness. When fully developed, it is characterized by redness, increased *mucous*, not *lachrymal*, discharge, inconsiderable pain, and *no intolerance of light*. The redness is superficial, and of a bright scarlet colour, forming a striking contrast to the rose or pink tint which belongs to the inflammation seated in the sclerotica. The distended vessels are quite superficial, and of a scarlet colour. They may be readily pushed aside by moving the eyelids. The redness is generally in patches, the membrane having a mottled appearance; but, in the fullest development of this affection, the whole surface becomes of a bright red. The redness begins at the circumference of the globe, and gradually advances towards the cornea; but at first it is confined to the palpebral conjunctiva, or to the angle of reflection. In severe cases, little ecchymoses are sometimes seen in the conjunctiva, denoting the activity of the inflammation; and sometimes small vesicles, containing a serous fluid, are formed, usually near the margin of the cornea.

Catarrhal ophthalmia produces much swelling of the conjunctiva, yet nothing like chemosis, the only approach to which is a loose serous effusion, raising the mucous membrane from the sclerotica.

When the lachrymal discharge, observed in the very commencement, stops, its place is supplied by increased secretion of mucus, which is at first thin, but becomes thicker as the

inflamed conjunctiva goes through certain stages, assuming a whitish or yellowish appearance, and even resembling pus. Its quantity depends on the degree and extent of the inflammation : it may be just sufficient to collect in small quantity at the corners of the eye ; a whitish streak may be seen on the inside of the lower eyelid at the angle of reflection ; there may be enough to form more or less copious incrustations about the cilia, and agglutinate the edges of the lids at night ; or it may constitute a profuse discharge, hardly distinguishable from that of mild purulent ophthalmia. In every marked case of catarrhal inflammation of the eye, the eyelids are always more or less affected. Whenever the attack is severe, other mucous membranes suffer ; hence, pain, and sense of weight about the frontal sinuses and antrum ; disordered stomach, foul tongue, chills, heat, head-ach, &c.

According to Mr. Lawrence's further correct description, this species of ophthalmia is distinguished from common inflammation of the external tunics by its catarrhal origin ; the diurnal remission, and nocturnal exacerbation of the symptoms ; the absence of pain and intolerance of light, even when there is great general redness ; the bright red tint of the membrane and of the distended vessels ; and the mucous discharge. From purulent ophthalmia, it is distinguished by its much milder character, and by its not being contagious ; if the latter always be so, which, in Mr. Lawrence's opinion, and that of the generality of foreign surgeons, has not yet been proved.

In general, catarrhal ophthalmia readily yields to proper treatment, and is therefore free from danger. If the inflammation be violent, neglected, or badly treated, it may extend to the sclerotica and cornea, causing ulceration and opacity of the latter, and thus seriously injuring the organ. Sometimes it is restricted to the eyelids.

The origin of the complaint is mostly referred to atmospheric causes. Exposure to drafts of air and cold winds, especially in damp, foggy weather, often gives rise to it. Length of exposure, without exercise, is said to favour the action of the cause : hence, soldiers on watch, or in camp, very often suffer. Great changes in the atmosphere from heat to cold, within a short period, bring on catarrhal affections. These vicissitudes are most common in hot climates, where the burning heat of the day is succeeded by a chilly night air, often combined with heavy dews, to which soldiers are frequently exposed by the nature of their duty. A contaminated state of the atmosphere, produced by the hydrosulphuret of ammonia generated in privies, or by the continuance of numerous in-

dividuals in one room or building, is a common cause of catarrhal ophthalmia, and accounts for its frequency in barracks, schools, and other crowded institutions. Like other diseases of mucous membranes, it often prevails epidemically in towns, or certain districts, no doubt in consequence of particular, but unknown, changes in the constitution of the atmosphere. Sometimes it prevails at the same time with an epidemic influenza, and it is alleged, as a remarkable circumstance, that all those persons who are attacked with ophthalmia escape the influenza.*

In catarrhal ophthalmia, mild antiphlogistic treatment will suffice, and it is not necessary to reduce the patient very much, as in some other cases of inflammation of the eye. Venesection may in general be dispensed with, unless the patient be young and of full habit, and the inflammation in both eyes, and severe. In ordinary cases, cupping and leeches will be sufficient. The bowels should be freely opened. If the tongue be foul, an emetic may follow the loss of blood. Saline and sudorific medicines may then be given, and the warm bath, or pediluvium, used at night.† But, in very slight cases, nothing more is necessary, after evacuations, than a dry, cool atmosphere, a low regimen, and the frequent application of cold spring-water, or any weak astringent lotion, to the eye. Mr. Lawrence, I observe, gives the preference to warm water, or poppy fomentations. When little febrile excitement is present, Mr. Welbank recommends the early use of astringent collyria, to prevent the formation of vesicles: and mentions one composed of a grain of the extract of belladonna, two or three grains of sulphate of copper, and four ounces of water, as very useful.‡ In a later stage, when the secretion is thick, and resembles pus, the collyrium may contain lapis divinus, nitrate of silver, alum, or Bates's camphorated lotion. The latter and the vinous tincture of opium were much used by the late Mr. Ware; but though they answer very well, they are not superior to other stimulants of equal strength.

To prevent the agglutination of the eyelids in the night, their edges may be smeared at bed-time with a little spermaceti cerate, or any other simple ointment.

After the inflammation has been lessened by the foregoing means, blisters may be employed, if necessary, which will not often be the case.

* Frick on the Diseases of the Eye, p. 26.

† Lawrence's Lectures.

‡ Note, Op. cit. p. 27.

The eye need not be covered, unless a strong light should be offensive, when a common green shade may be used.

Purulent ophthalmia is a violent form of inflammation of the conjunctiva, beginning in the linings of the eyelids, and extending to the mucous surface of the eyeball. When severe, and uncontroled by due treatment, it soon attacks the cornea, which it either completely spoils, or so changes in structure, that vision is either destroyed, or seriously injured. The whole texture of the membrane swells and becomes thicker; its vascular tissue is developed; and its surface acquires an intense bright-red. The mucous surface is rendered villous, pulpy, and granular, like the villous surface of the foetal stomach, and from the secreting surface, thus produced, the puriform discharge flows. The changes in the cornea, are sloughing, ulceration, and interstitial deposition, causing opacity. The sloughing and ulceration often expose the anterior chamber, causing prolapsus of the iris, and may, by letting out the humours, destroy both the function and form of the eye. (*Lawrence.*)

In the progress of the disease, the swelling of the conjunctiva sometimes increases in such a degree, that the upper eyelid cannot be raised, and projects so far, as entirely to cover the lower eyelid. The outside of the upper one becomes red and swelled, and even the cheeks and face.

The disease, from its commencement, is attended with pain, which gradually increases, and is sometimes periodical, coming on generally at night. A little before the puriform discharge is established, a spontaneous bleeding frequently occurs from the eyelids, and is always followed by some mitigation of the symptoms. Occasionally, the conjunctiva, round the cornea, becomes so red and swelled, that it seems like a thick ridge of flesh encircling the latter membrane, which seems sunk in the eye, frequently little more than its centre being visible. If the matter be allowed to lie some time upon the cornea, it may acquire a thick consistence, and so resemble membrane that the inexperienced surgeon may suppose the cornea has suppurated.*

Respecting the causes of purulent ophthalmia, I am not aware, that any very useful remarks can be offered in addition to those delivered on the causes of catarrhal ophthalmia. The circumstances, giving rise to the form of it which occurs in infants, are not exactly determined, though a multitude of conjectures may be found in books. The purulent ophthalmia

* See Frick on Diseases of the Eye, pp. 40—42.

of adults, including the Egyptian ophthalmia, is sometimes imputed to the effects of vivid light and heat reflected from a sandy soil; and to exposure to cold, damp, nocturnal air, after the eye has been unduly stimulated and weakened in the day. With few exceptions, the belief of army surgeons, as well as of the generality of practitioners in England, is, that purulent ophthalmia is infectious; that is to say, capable of being communicated by the application of the discharge to a healthy eye. One form of purulent ophthalmia is supposed to arise either from the suppression of a gonorrhœa, or the inadvertent application of the discharge from the urethra to the eyes; a case, which I shall dismiss from this work, until satisfactory proofs of its reality have been given. Even the believers in its existence represent it as very rare, which could not be, if the causes were such as are conjectured.

In the army, the treatment of purulent ophthalmia has generally commenced with taking away sixty or seventy ounces of blood from the arm, followed by purgatives, and nauseating doses of tartarized antimony. In private practice, where the generality of patients would not bear the sudden loss of so much blood without great injury of their health, about sixteen ounces may be drawn from the arm by a free orifice, and cupping or leeches employed on the temple. For young children, leeches are the most proper.

When the disease has been neglected, the patient debilitated, and the discharge profuse, bark is generally prescribed; and its extract, or the sulphate of quinine, will be found the most convenient for children. If the cornea be threatened with sloughing, bark is stated to be frequently capable of preventing the evil.

The eye must be washed, every three or four hours, with any weak astringent lotion, injected under the eyelids with a syringe. A drachm of Bates's camphorated lotion in two ounces of water; a weak solution of the sulphate of zinc, common alum, or sulphate of copper, will answer the purpose. Blisters are also to be applied behind the ears, or on the nape of the neck. Afterwards, the local applications may be strengthened; even the undiluted liquor. plumbi acetatis, tincture of opium, and oil of turpentine, have been used with benefit.* To prevent the eyelids from adhering together in

* {The solution of lunar caustic, of different degrees of strength, from two to six grains to the ounce of water, has generally been found to be the best application. If it can be applied so as not to affect the cornea, or as in cases of gonorrhœal ophthalmia where the discharge from the conjunctiva is profuse, so as to lessen its effect, it may be applied as strong as ten or twelve grains to the ounce of water, two or three times a day. }

the night, their edges may be smeared with spermaceti ce-rate.

Scrofulous inflammation of the conjunctiva, like every other form of scrofula, attacks children more frequently than adults. In its simplest form, it is almost peculiar to children, stationary, marked by a very slight redness of the sclerotic conjunctiva, and the utmost intolerance of light.* By the late Mr. Saunders, pustules of the conjunctiva, aggregated at the margin of the cornea, or appearing separately, or successively at any part of its surface, were deemed a specific character of strumous ophthalmia,† with which the usual marks of a scrofulous constitution were more or less connected. These small pustules are apt to burst, and change into ulcers. The eyelids, particularly the upper, are much swelled and reddened, and generally half closed, on account of the pain always resulting from exposure of the eye to light. The cheeks are irritated by the constant dribbling of the tears over them, and the patient is incessantly rubbing his eye. The pain, caused by the light, renders it difficult to obtain a sight of the affected eye, especially in children. The surgeon should sit down, put the child's head between his knees, and, placing his right forefinger over the orbit, gently raise the skin of the upper eyelid with its point, while the lower one is depressed with the forefinger of the other hand.‡ Although great pain is excited in the eye by light, the disorder, at all other periods, is remarkable for being attended with scarcely any pain. When the eye is carefully examined, a diffused and unequal redness is seen, the vessels running in distinct fasciculi towards the cornea, at the circumference of which most of them terminate. However, a few reach even to its centre; and each fasciculus ends in one of the minute pustules already described. In a more advanced stage, the vessels of the conjunctiva pass over the margin of the cornea to its very centre, and the latter membrane itself becomes of a reddish-brown colour, thickened, and much altered in texture. The iris and pupil are thus concealed, and vision seriously interrupted.

The causes of strumous ophthalmia were referred by Mr. Saunders to bad air, improper food, and cold. Mr. Travers regards the disease as intimately connected with a disordered state of the secreting surfaces of the alimentary canal and skin.§ Probably, whatever would bring on catarrhal inflam-

* Travers's Synopsis, &c. p. 92.

† On Diseases of the Eye, p. 99.

‡ Frick on Diseases of the Eye, with Notes, by R. Welbank, p. 30.

§ Synopsis, p. 93.

mation of the eyes in a healthy person, would produce this variety in a scrofulous constitution. In the treatment of strumous ophthalmy, rigorous antiphlogistic measures are never necessary. The secretions of the alimentary canal and skin, however, should be restored, for which purpose Dr. Frick recommends the liquor. ammon. acet., combined with vinum antimonii, to which may be added a small quantity of syrup of poppies, when it is to be given to children. The pulv. ipecacuanhæ comp., and calomel with opium, are also described as fit medicines. The eye should be protected from the light with a green shade, or by darkening the room. The intolerance of light would only be aggravated by bandages; but a blister, kept open on the nape of the neck, diminishes it with great effect. If the cornea be opaque, calomel, or the blue pill, or the oxymuriate of mercury, with opium, should be given so as slightly to affect the system.* The state of the general health, and that of the eye which is dependent on it, may sometimes be improved by bark, joined with the tinct. guaiaci ammon. (*Scarpa*). In every instance, a pure air, cleanliness, and a light nutritious diet, are of essential service. The sea-air, and the regular use of a flesh-brush, often do much good. When ulcers are present, a solution of nitrate of silver, (two grains to an ounce of distilled water) may be injected on them. (*Saunders*.) When the disease is accompanied with violent contractions of the orbicular muscle, fumigations of laudanum in boiling water will afford great relief. For the prevention of a relapse, an issue, kept open in the nape of the neck,† or arm, is one of the most effectual plans.



CHAPTER XII.

IRITIS.

ALTHOUGH this subject might have been classed with other inflammations of the eye, and treated of in the preceding chapter, I think its importance well entitles it to separate consideration. Next to the conjunctiva, the iris is that texture of the eye, which is most frequently affected with inflammation.

* Travers's Synopsis, p. 259.

† Welbank, in his edit. of Dr. Frick's Work, p. 35.

The iris often becomes inflamed, in consequence of surgical or accidental wounds of the eyeball ; it may indeed arise from various external causes ; or it may originate from some peculiar diathesis of the whole system. Thus one species of iritis, having a very distinct character, is produced by the venereal disease, especially that form of it, which is described by Mr. Carmichael under the name of the *papular venereal disease*. Sometimes inflammation extends to the iris from other textures of the eye. The iris constitutes the principal seat of inflammation in the distinct kind of ophthalmia, frequently met with in gouty constitutions. In rheumatic ophthalmia, the inflammation, though never originating in the iris, frequently extends to it.

Scarcely any disease to which the eye is subject, has a more immediate or rapid tendency to destroy vision, than inflammation of the iris. In *idiopathic iritis*, (as Professor Schmidt observes,) besides the common symptoms of ophthalmia, certain changes happen at the very commencement, indicating the seat of inflammation. The pupil appears contracted, the motions of the iris are less free, its brilliancy fades, and the pupil loses its natural bright black colour. The iris becomes thickened and puckered, with its inner margin turned towards the crystalline lens. The change of colour happens first in the lesser circle of the iris, which becomes of a darker hue ; and afterwards in the greater circle, which turns green, if it had been greyish or blue ; and reddish, if it had been brown or black. The redness accompanying these changes is by no means considerable, and is at first confined to the sclerotic coat, in which a number of very minute rose-red vessels are seen running in straight lines towards the cornea. In the words of Mr. Saunders, the vascularity of the sclerotica is very great, whilst that of the conjunctiva remains much as usual, the plexus of vessels lying within the latter tunic. The inosculations of these vessels are numerous, and form a rose-coloured zone at the junction of the sclerotica and cornea. Here the vessels disappear, not being continued over the transparent cornea, as in a case of simple ophthalmia, but penetrating the sclerotica, in order to pass to the inflamed iris. The red zone, here mentioned, has been deemed a certain mark of iritis ; but, this is a mistake, since it also presents itself in strumous ophthalmia. The irritation caused by the light is distressing, and the patient is much incommoded by any pressure on the globe of the eye, or by the rapid or sudden motions of this organ. Considerable uneasiness is felt over the eyebrow, and acute lancinating pains shoot through the orbit towards the brain. The pupil loses its circular form,

becomes somewhat irregular, and presents a greyish appearance. Examined with a magnifying glass, this appearance is found to be produced by a substance very like a cobweb occupying the pupil, and which can soon afterwards be distinguished, even without the aid of the glass, to be a delicate flake of coagulable lymph. Into this, says Professor Schmidt, the processes or dentations of the irregular pupillary margin of the iris seem to shoot, and it is afterwards found that adhesions are apt to be established at these points. Owing to these adhesions, the patient, whose vision has been all along indistinct, is now able to see only one side or part of an object. While these changes are taking place in the posterior chamber, others equally remarkable are occurring in the anterior. The iris projects more and more towards the cornea; a small orange-coloured tubercle now forms upon its surface, gradually enlarges, and is full of a purulent fluid. At length it bursts, and discharges its contents into the anterior chamber, so as to produce the case termed *hypopium*. If more than one tubercle be present, the whole anterior chamber may be filled with pus, and the iris be completely hidden.

According to Mr. Travers, when the inflammation commences in the iris, and is not propagated to it secondarily, the conjunctiva is less reddened, and consequently the vascular zone is plainer.* When iritis is not subdued by efficient treatment, the consequences may be a more or less complete closure of the pupil, with opacity of the capsule of the lens; adhesion of the iris to the cornea, with more or less opacity of the latter; and even an amaurotic affection of the retina. Schmidt, Beer, and many English surgeons, believe that the iris is subject to an inflammation, which is as characteristic of the presence of syphilis in the constitution, as any other secondary symptom. As, however, this iritis frequently comes on in persons, while they are actually under the influence of mercury, or after they have used it profusely for papular eruptions, pains in the large joints, and other anomalous diseases, often confounded with syphilis, it is sometimes regarded, (and as I conceive justly) not as an effect of true syphilis, but rather as a pseudo-syphilitic affection. A pale redness all around the cornea is the first symptom perceived in the *syphilitic iritis*: this is at first seated in the sclerotic coat alone, but the conjunctiva very soon shares in it, and afterwards becomes the redder of the two. However few the vessels may be elsewhere, there is always a broad zone of them all round the cor-

* Synopsis, p. 133.

nea. The redness has a peculiar tint, being brownish, something like the colour of cinnamon.* From this zone, the vessels have a disposition to extend under the edge of the cornea. The whole of this last membrane now becomes uniformly hazy, losing its clearness, without being in any place actually untransparent. The pupil becomes contracted, and the iris limited in its motions, as in common iritis, but the pupil, instead of preserving its natural situation, is removed in a direction upwards and inwards towards the root of the nose, and is irregular. The iris also loses its natural colour, and projects forwards. An aggravation in the symptoms always takes place towards evening, the intolerance of light, and painful sensibility of the whole eye increasing, and a gush of tears following every change of light and temperature. At length a regular nightly pain begins, which is extremely severe, and strictly limited to that part of the cranium which is immediately over the eyebrow. It usually comes on between six and seven in the evening, gradually increases, reaches its utmost height about midnight, and then diminishes till about four or five in the morning, when it ceases. After every such attack of pain, the pupil is found more contracted, drawn farther upwards and inwards, the iris being at the same time more altered both in colour and form, the quantity of lymph increased, and consequently vision more impeded.

Peculiar appearances then take place in the iris, for either on its pupillary, or ciliary margin, or on both, there arise one or more reddish-brown tubercles, which have a spongy look. Their growth is pretty rapid. Lardy-looking ulcers also sometimes appear on the cornea and white of the eye, or on the integuments of the eyelids. Even when syphilitic iritis terminates in the most favourable manner, the eye for a long time afterwards is peculiarly sensible to the influence of cold and moisture. On every exposure to them, the organ becomes morbidly sensible to light, exhibits a slight blush of red, and discharges tears. Indeed, frequently for more than a year afterwards, on every sudden change of temperature, a pale violet-coloured zone appears around the cornea, but goes off when the eye has remained for some time in an equal temperature.†

* The conjunctiva and sclerotica "have a brick-dust or dusky red, instead of a bright scarlet hue, and the lymph is compact and brown, and intimately adhering to the iris, instead of curd-like, loose, and of a yellowish white colour." Travers, in Surg. Essays, part i. p. 69.

† See Quarterly Journal of Foreign Medicine, vol. i., where may be found Schmidt's description of two other forms of iritis, viz. the *Gouty* and *Rheumatic*.

The principal danger in iritis depends upon the effusion of lymph, its quick organization, the rapid formation of adhesions between the iris and other parts, and the closure and obstruction of the pupil. Of late years, great improvement has been made in the treatment of this disease; an improvement derived from a knowledge of the fact, that mercury is one of the most effectual means of stopping the effusion, and promoting the absorption, of lymph in the adhesive inflammation.*

In the idiopathic iritis, before lymph is effused, copious bleeding from the veins of the arm, quickly followed by cupping on the temple, or the application of leeches near the eye, cathartics, and nauseating doses of tartarized antimony, with a view of enfeebling the pulse, are the means from which most benefit may be expected. In many cases, it is even necessary to repeat the topical bleeding several times. As soon as bleeding has been practised, the extract of belladonna should be used for the purpose of resisting the tendency of the iris to contract, and become adherent to the capsule of the lens. I know that some judicious surgeons consider the early application of belladonna objectionable, as tending to increase the inflammation; but, if smeared on the eyebrow, and not applied to the eye itself, it will not have the effect which has been apprehended. If the inflammation is not immediately relieved by these means, mercury should be employed without delay. As a critical writer justly observes, it is not sufficient in this disease to be satisfied with relieving symptoms as they occur; if we are so, the only opportunity of acting with effect will be lost. If we wait till coagulable lymph is formed, it may become so organized, before the mercurial action can be excited, as to resist all subsequent remedial measures.†

At all events, when the effusion of lymph begins, every possible means must be adopted for resisting this process, and bringing about the absorption of the substance already deposited in the posterior chamber, in the pupil, or upon the iris. Mercury must be freely exhibited, in order to affect the constitution as soon as possible. The ointment, or the pil. hydrarg. with opium, may be employed, and sometimes both together. In this second stage of iritis, Beer used to prescribe calomel united with opium, and a collyrium containing oxy muriate of mercury, mucilage, and a considerable quantity of vinum opii; and when this lost its effect, he introduced daily between the

* See Dr. Farre's Letter in the Surgical Essays, by Sir A. Cooper and Mr. Travers.

† See Anderson's Quarterly Journ. vol. iii. p. 13.

eyelids a small quantity of salve, composed of two drachms of fresh butter, six grains of red precipitate, and eight grains of extract of opium. He observes also, that frictions once a day, over the eyebrow, with mercurial ointment, containing opium, will materially assist in producing an absorption of the effused lymph.*

In the early stage of this form of iritis, fomenting the eye, and darkening the patient's room, will sometimes mitigate the violence of the pain; but, cold applications are never serviceable. (Schmidt.) They were sometimes used, however, by the late Mr. Saunders. According to Schmidt, when blisters are used in the early stage, the best situation for them is the nape of the neck.

In the case regarded by authors as syphilitic, general bleeding is not considered always so indispensable as in idiopathic iritis; yet it may frequently be practised with advantage; cupping on the temple, leeches on the eyebrow, and purgatives, are constantly requisite. The nightly attacks of pain, which are so invariably followed by an aggravation of all the symptoms, are to be prevented by rubbing well into the part over the eyebrow a small quantity of mercurial ointment with opium, a short time before the pain is expected to come on, and then covering the eye with a folded piece of warm linen. This plan is to be repeated, when the pain threatens to come on about midnight. In conjunction with these means, mercury must be employed so as to affect the constitution, either in the form of ointment, or of calomel pills with opium, which last must be taken two or three times a day.

The form of iritis, preceded by, or accompanying papular and other eruptions not truly syphilitic, also requires for its cure a combination of the depleting with the mercurial plan. In this form of the venereal disease, termed by Mr. Carmichael,† on account of the nature of the eruption, *papular*, iritis will frequently occur, whether little mercury, or none at all, has been employed, and consequently its origin cannot be rightly imputed to this medicine. It is true, that it also comes on after debilitating courses of mercury, injudiciously persisted in for the removal of anomalous eruptions and pains in the large joints, &c.; but, mercury is not properly the cause of it. All that can be said is, that it does not prevent its attack; neither does it hinder the papular eruption from taking place, however early it be employed. Two facts, completely established, at all events are strongly against the idea, that

* Lehre von den Augenkrankheiten, b. i. p. 450. Wien. 1813.

† See Carmichael on Venereal Diseases, p. 137. 8vo. Lond. 1825.

iritis proceeds from the abuse of mercury ; the first is, that iritis never takes place in cases where mercury is prescribed, long and copiously, for the relief of disease of the liver, or other complaints, decidedly neither syphilitic, nor pseudo-syphilitic. The second is, that mercury is one of the best means of preventing the irremediable consequences of iritis ; a circumstance which cannot be reconciled with the preceding hypothesis.



CHAPTER XIII.

CLOSURE OF THE PUPIL

Is most frequently the consequence of inflammation of the internal membranes of the eye, especially the iris. Sometimes, it follows operations for the removal of cataracts. After an indeterminate time from the operation, the pupil is perceived daily to diminish in diameter, without any marked inflammation within the eye, and closes so much, that it can hardly admit a pin's head. The iris is motionless, assumes a radiated rugose appearance, and when no opacity exists behind it, a little black speck is seen in its centre. In this state, if the retina be sound, the patient may sometimes regain a considerable power of vision by the formation of an artificial pupil.

The many different modifications of the operation may all be referred to three principal methods ; the first is a simple cut through the iris, without the removal of any portion of it. (*Coretomia.*) The second is an incision in the iris, and the removal of a part of it. (*Corectomia.*) The third consists in separating some of its external ring from the ciliary ligament. (*Coredialysis.*)

The first method may be executed with Sir William Adams's iris-knife, or a couching needle, that has a sharp edge only on one side : the needle is to be introduced through the sclerotica, about a line and a half from the cornea, and after perforating the iris, towards the external angle, its point is to be conducted transversely through the anterior chamber, as far as the margin of the iris next the nose : then the sharp edge is to be turned backward, and withdrawn, so as to make a transverse division of the iris. Cheselden, who first ventured to form an artificial pupil, passed the needle into the posterior chamber as far as the nasal edge of the iris, when he thrust it from

behind forwards through the iris, and cut this membrane transversely from its internal to its external edge. At a subsequent period, Janin tried the plan of opening the cornea, as is done in the extraction of the cataract, and then divided the iris with scissors, from below upwards, near the pupil, on the side next the nose.

In consequence of the tendency of the new opening to close again, these methods have very frequently failed. With the view of lessening the chance of a closure of the new pupil, Maunoir made a double incision in the shape of the letter V. An incision is made in the cornea, at its lower, or lateral segment, as circumstances may require, and about half as extensive as that usually made for the extraction of the crystalline lens. The surgeon is then to use a pair of very fine scissors,* the upper blade of which is probe-pointed, while the lower one has a point as sharp as that of a lancet. Through the small opening in the cornea, the scissors are introduced shut, with the flat part in a line parallel to the transverse diameter of the iris, and as soon as the point of the instrument has nearly reached the great margin of the iris, nearly opposite the incision in the cornea, it is gently opened, and turned in such a manner that the point of the lower blade may perforate the iris, and pass over its posterior surface, until the other probe point has reached the part where the cornea and sclerótica join. The iris is then to be cut transversely, by a single stroke, as nearly as possible in its centre. Another incision is then to be made, diverging from the first, so that the two cuts may produce in the middle of the iris a triangular flap, shaped like the letter V, with the apex exactly in the centre of the iris, and the base near its great margin. Five or six days afterwards, the apex is found retracted towards the base, leaving a square, or crescentic opening in the middle of the iris.

Baron Wenzel first practised the excision of a portion of the iris. He introduced the point of the cornea knife into the anterior chamber, exactly in the same manner as in the extraction of the cataract, but when it had arrived nearly as far as the centre of the iris, it was plunged into this membrane, and then, by a slight motion of the hand backward, it was brought out again, about three quarters of a line from the part in which it entered. Next, the incision of the cornea was finished as in cases of cataract, the section of the iris being thus completed first, and presenting a small flap, which was cut off with

* See Plate 5, figs. 1 and 2.

Fig. 1.

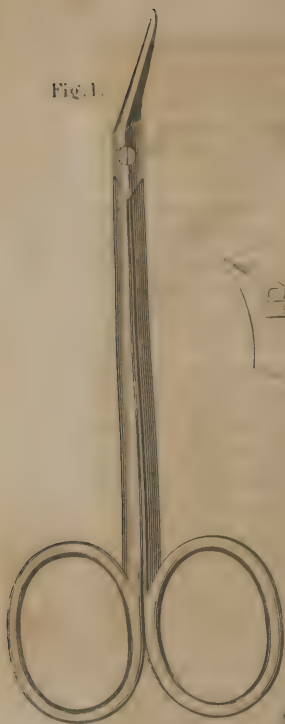


Fig. 5.

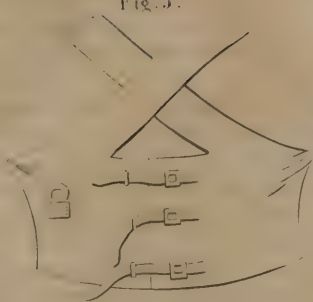


Fig. 2.



Fig. 6.



Fig. 3.

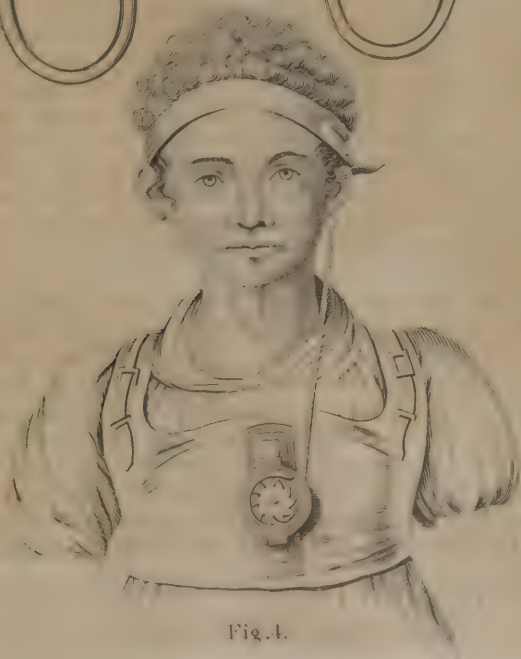


Fig. 4.

scissors. The modes of cutting out a piece of the iris are very numerous. Guerin, after the incision in the cornea, made a crucial division of the iris, and then cut off the four angles with scissors.

Beer used to open the cornea, draw out the iris by means of a fine hook, and snip off a small portion of it.

Gibson made a puncture in the cornea, with a broad cornea knife, within a line of the sclerotica, to the extent of about three lines. All pressure was then removed from the eyeball, and the cornea knife gently withdrawn. The consequence of this was, that a portion of the aqueous humour escaped, and the iris fell into contact with the opening in the cornea, and closed it like a valve. A slight pressure was now made upon the upper and inner part of the eyeball, and gently increased or varied in direction, till the iris gradually protruded, so as to present a bag equal in size to a large pin's head. This protruded portion was cut off with a pair of fine curved scissors, and all pressure immediately discontinued. The iris receded into the eye, and the piece that had been removed left an artificial pupil, more or less circular.

The operation of detaching a portion of the circumference of the iris from the ciliary ligament (Coredialysis,) is also done by various processes. Scarpa used to effect it with a couching needle, on the side nearest the nose; but, as the new opening was found to diminish in time, so considerably as to become useless, he abandoned this method, and recommended, instead of it, Maunoir's operation. Schmidt and Assalini's modes consisted in opening the cornea, near the place intended for the artificial pupil, seizing the iris with a fine hook, or very small dentated forceps, and tearing a portion of it from the ciliary ligament. The method invented by Reisinger, has the merit of great ingenuity, and, what is equally important, Professor Beer renounced his own plan in favour of it. In the operation, a very fine double hook* is used, which, by slight pressure of the finger and thumb, is made to resemble a single one. A puncture, one and a half, or at most two lines in length, is first made in the cornea, near its margin, with a lancet-shaped knife, and, if possible, one quarter of an inch from the part of the iris which is to be separated. The double-hooked forceps closed, is now to be introduced into the puncture, and conveyed, with the points of the hooks turned downwards, as far as the spot where the iris is to be separated, but always as near as possible to its ciliary edge.

* See Plate 7, fig. 1.

The points of the hooks are then to be directed towards the iris, and the blades, slightly opened, are to be made to enter the iris. The forceps are now to be shut, and drawn towards the wound in the cornea. Thus a considerable portion of the iris will be detached, brought through the wound, and left to unite with the cicatrix. When the iris cannot be prevented from shrinking into the eye again, the part of it drawn out is to be cut off, the operation being then a combination of core-dialysis with corectomia. When the iris is very tense, no prolapsus need be formed, as a free separation, effected with the double forceps, will leave a permanent opening of sufficient size.

A full detail of the circumstances, by which the choice of the particular method of operating ought to be determined, forms too long a subject for present consideration. A few general directions are all that can be given.

Corectomia, or a simple incision in the iris, is proper, *when this membrane has a very tense appearance, and when there is no crystalline lens behind it*, as when the closure of the pupil has followed an operation for the removal of cataract. When the capsule of the lens remains, and is firmly adherent to the iris, the latter sometimes cannot be divided with a knife, or sharp-edged needle, as it would sooner give way at the ciliary ligament. In this case, the operation must either be done with Maunoir's scissors, or a separation at the ciliary ligament be preferred, as advised by Mr. Guthrie; because "the formation of a triangular opening with the scissors would not be easily accomplished to a sufficient extent, and the simple division of the central part of the iris would, in general, be ineffectual, in consequence of the thickened capsule preventing the necessary retraction of the fibres of the iris."*

When the case is an indelible central opacity of the cornea, preventing, or seriously interrupting the entrance of the rays of light to the retina, while the iris, crystalline lens, and its capsule, are healthy, and the pupil natural, the right operation is corectomia, or the excision of a piece of the iris, first made to protrude through an opening in the cornea. The other methods would not here be eligible, for several reasons, only one of which need be specified, namely, they could not be executed without disturbing the healthy lens and its capsule, the consequence of which would be the loss of their transparency.

* Operative Surgery of the Eye, p. 466.

When the pupil is contracted, when the iris is adherent to the lens or its capsule, when flakes of organized lymph contribute to the interruption of sight, and the motion of the iris appears prevented by its attachment, the indications are to break this connexion, and to remove the opaque matter. Here, if the adhesion can be overcome with the needle, and the pupil seems large enough, the iris need not be cut at all, no process, analogous either to corectomia, or coredialysis, being applicable. After the adhesion has been broken, the texture of the lens is to be opened with the needle, the passage of which behind the iris would otherwise be inevitably followed by a cataract. The belladonna is to be applied immediately after the operation, in order to dilate the pupil, and keep it away from the parts behind it, in which state it must be retained until the lens is dissolved. If, after the iris has been detached, the natural pupil should seem too small, the point of the needle must be conducted forwards through the pupil, and the inner edge of the iris divided.*

When the pupil is still more contracted, and there is reason to believe the adhesion of a very firm kind, Mr. Guthrie approves of corectomia, or a free transverse division of the iris with a sharp edged needle, or iris-scalpel, performed nearly in the manner directed by Sir William Adams. The lens is then to be divided in every direction, and, if possible, the fragments pushed into the anterior chamber. Frequently, the reduction of the lens to fragments will require a second operation.

When there is a central opacity of the cornea, combined with a constricted pupil, and a cataract, Mr. Travers prefers corectomia on the side towards the nose, and the extraction of the lens through the new opening, which, if it should seem too small, is then to be enlarged by snipping off the flap of the iris. In the same kind of case, some practitioners prefer Reisinger's combination of coredialysis and corectomia, and removing the cataract by a subsequent operation; while others adopt corectomia, break the cataract to pieces, and push the fragments into the anterior chamber.

When the pupil is closed, and the iris is partially adherent to the opaque cornea, corectomia, that is to say, the removal of a portion of the fixed iris, after hooking it through a limited section of the cornea, is frequently preferred. Mr. Travers, however, gives the preference to corectomia, making an extensive vertical, or oblique division of the fibres of the

* Operative Surgery of the Eye, p. 470.

iris, with the iris-knife, or Maunoir's scissors, except when the opacity of the cornea is too extensive for an incision, in which case Scarpa's coredialysis is recommended.* Were the adhesion slight, and the opacity trivial, the proper size, shape, and position of the natural pupil, might sometimes be restored, by simply breaking or cutting the attachment, and then hindering its formation again, by keeping the pupil moderately dilated by means of belladonna.

I shall conclude with a few general instructions.

When circumstances permit, a sound part of the iris should always be preferred for the place of the new pupil, to an unhealthy portion of it.

When the sight of one eye is entirely lost, and some degree of vision is yet enjoyed through a partially closed pupil of the other eye, an operation for the improvement of the latter is unjustifiable, as its failure would consign the poor patient to complete blindness.

When one eye is perfectly sound, the operation is condemned, as not improving the patient's powers of vision.

A tremulous state of the iris, an extensive opacity of the cornea, and a gouty, scrofulous, or rheumatic constitution, are highly unfavourable to the success of an operation. When the retina is diseased, the eye either larger or smaller than natural, or its consistence and shape changed, the operation can do no good, and of course should not be attempted.

When the new pupil cannot be made in the centre of the iris, the following places are the most advantageous, in the order here specified. First, the inferior part of the iris, inclining inwards. Secondly, the internal, a little below the transverse diameter of the eye. Thirdly, the inferior and external part; the upper being the least eligible, on account of the corresponding portion of the cornea being covered by the upper eyelid.†

Many attempts to improve vision, by the formation of artificial pupils, terminate in complete blindness, owing to the neglect of means calculated to lessen the inflammation, necessarily produced within the organ by the operations themselves. In fact, the same kind of treatment is here frequently requisite, as in iritis.

* Synopsis of the Diseases of the Eye, p. 342.

† See Guthrie's Operative Surgery of the Eye, p. 442.

CHAPTER XIV.

PROLAPSUS OF THE IRIS.

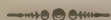
SOMETIMES, when the aqueous humour escapes through an ulcer, or wound of the cornea, a portion of the iris protrudes through the same opening, being generally of a brown or greyish colour, and surrounded, at its base, by an opaque circle of the cornea. It is frequently called *staphyloma iridis*, and its size varies from that of a pin's head to that of a small pea.

The inconveniences produced are, a pricking pain in the eye; an oppressive sense of tightness in the whole eyeball; inflammation of the conjunctiva and eyelids; a copious effusion of tears; and an absolute inability to endure the light. The pupil deviates from the centre of the iris, towards the seat of the prolapsus, and assumes an oval shape. In old cases, the protruded portion of the iris frequently becomes less sensible, and the acute distress, attending the earlier stages of the disease, subsides.

In the early stage, some recommend and endeavour to replace the iris with a small probe. In the case of a wound of the cornea, perfectly recent, where the prolapsus itself is not adherent, the rightness of such practice cannot be doubted. Under other circumstances, the attempt is generally considered useless, and likely to do harm.

In general, the best method is to touch the projecting portion of the iris with *argentum nitratum*, so as to form an eschar. The patient experiences acute pain during the operation; but it soon subsides, when the eye has been bathed with warm milk. The consequent relief only lasts while the eschar remains adherent; and when this is detached, two or three days afterwards, the above-mentioned complaints are experienced again, though in a milder degree. The caustic is now to be repeated, and even used, if necessary, a third and fourth time, until the prominent part of the iris is sufficiently reduced to a level with the edges of the wound, or ulcer of the cornea, to create no obstacle to cicatrization. Then the surgeon is to direct a collyrium containing zinc, and the *ung. hydrarg. nitrat.* (lowered,) is to be smeared over the inner surface of the eyelids, every morning and evening. When the prolapsus is large, the projection of the iris may be cut off

with scissors. By these proceedings, it is clear, that the deformity of the pupil is not remedied: however, all the annoyance of the disease is removed, and sometimes even the shape of the pupil afterwards gradually improves.



CHAPTER XV.

DISEASES OF THE CORNEA.

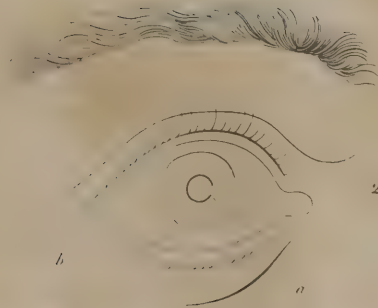
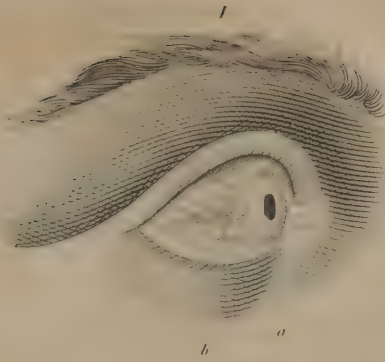
OPACITIES. Recent and superficial opacities should not be confounded with albugo and leucoma, which are of a clear pearl colour, affect the very substance of the cornea, and arise from severe acute ophthalmy, ulcers, or wounds of the part.

In the nebula, or slight opacity, the cornea presents a diffused cloudiness, that has no distinct boundary, but loses itself in the surrounding transparent portion of that membrane: The iris and pupil can be seen through a kind of dimness; and, of course, the patient is not entirely bereft of vision. The veins of the conjunctiva, greatly relaxed by the protracted duration of chronic ophthalmy, become preternaturally turgid, irregular, and knotty; first in their trunks; then, in their ramifications, near the union of the cornea with the sclerotic;* and, ultimately, in their minute branches, returning from the delicate layer of the conjunctiva, spread over the anterior surface of the cornea. When this happens, a milky albuminous secretion begins to be superficially effused in the interspaces between the red streaks.

In the early stage of nebula, active measures are necessary; for, though it may at first only occupy a small portion of the cornea, if left to itself, it will continue to extend towards the centre of this membrane; and as the veins become more and more varicose, it will convert the delicate layer of the conjunctiva, spread over the cornea, into a dense, opaque film.

The indications are, to remove the varicose state of the vessels; and, if that be impracticable, to cut off all communication between the trunks of the most prominent varicose veins of the conjunctiva, and those on the cornea. The first plan is executed by using Janin's ointment, or the ung. hydrarg. ni-

* See Plate 6, fig. 1. A, the nebula: B, dilated vessels.



trat., together with astringent collyria. The second is accomplished by the excision of the fasciculus of varicose veins, at the base of the opacity. But in many cases, besides these indications, there is another, though not mentioned by Scarpa, viz. the removal of the particular cause keeping up chronic inflammation of the conjunctiva. Thus, when its cure is owing to the granular, callous thickening of the lining of the eyelid, the cure of the latter affection is the most important step to that of the nebulous state of the cornea.

Albugo and *Leucoma* consist of a deep extravasation of dense lymph in the substance of the cornea, and arise as consequences of severe ophthalmia, especially what is called purulent, or of an ulcer, or wound of the cornea. The case, arising from the extravasation of lymph in violent ophthalmia, is named *albugo*; while the term *leucoma* is particularly applied to the white or pearl-coloured opacity resulting from a cicatrix.

A recent *albugo* may sometimes be dispersed by the same treatment, as is applicable to severe acute ophthalmia, viz. at first, general and topical bleedings, internal antiphlogistic remedies, and topical emollients; in the second stage, astringent, and moderately stimulating applications. However, when the action of the absorbents in the part has been, as it were, deadened, and the texture of the cornea is disorganized, nothing will avail. In recent cases, as soon as the inflammation of the eye has been subdued, the unguent. hydrarg. nitr. may be applied to the opacity, with a camel-hair pencil. The eye may also be frequently washed with a collyrium, composed of two scruples of muriate of ammonia, and four grains of verdigrease, dissolved in eight ounces of lime-water: the mixture is to stand twenty-four hours, and then be filtered.

In the true *leucoma*, arising from a cicatrix, the transparency of the cornea cannot be restored. Like every other scar, however, it becomes considerably smaller than the ulcer, or wound, of which it is the effect.*

Ulcers of the Cornea are frequently the consequence of the rupture of a small abscess, formed either beneath the conjunctival covering of the cornea, or in the very substance of the latter. The mode of formation is exemplified in some cases of violent inflammation of the eye; but, it is observed,

* {In simple opacities of the cornea, unaccompanied by a diseased state of the eyelids, or after a complete subsidence of inflammation of the eyeball, considerable benefit is often derived from applying a small quantity of calomel to the opacity every few days; the best application is, however, a weak solution of corrosive sublimate. }

that when an ulcer of the cornea arises from purulent ophthalmia, the ulceration generally begins externally, and extends more and more deeply, until it reaches into the anterior chamber. At other times, the ulcer is produced by the irritation of extraneous substances in contact with the eye, such as quick-lime, pieces of glass, &c.

Although abscesses of the cornea are slow in bursting, they should never be punctured; for the matter, which they contain, is so viscid, that not a particle of it ever issues from the wound, which always exasperates the disease. The safest plan is to let the pustule spontaneously burst; promoting this event, by fomentations, and bathing the eye with tepid milk and water.

An ulcer of the cornea is of a pale ash-colour; its edges are high and irregular; its margin is surrounded by a slight halo of lymph, or a nebulous appearance of the cornea; it creates acute pain, discharges a serous matter, and has a great tendency to spread. Sometimes, the pain is less severe, but more constant, than that experienced during the preceding inflammation of the organ; and it is always increased by exposure to light, and motion of the eyelids. To the deposition of lymph, around the sore, a fasciculus of vessels may be observed to proceed from the sclerotic conjunctiva; but they disappear when the sore has healed.

When ulcers of the cornea spread superficially, the transparency of the membrane becomes destroyed; when they penetrate the anterior chamber, the aqueous humour escapes, and a prolapsus of the iris may take place. If the ulcer is large, even the crystalline lens and vitreous humour may fall out; and in short a total destruction of the whole organ be the result. The cicatrix of a large ulcer impairs the texture of the cornea in such a degree, that the injury is irremediable.

Although the ulcer is first caused by inflammation, this is afterwards frequently kept up by the ulcer, and not the ulcer by the inflammation.

Just when the ulcer is making its appearance, and the inflammation of the conjunctiva, or sclerotic, is severe, antiphlogistic treatment is indicated; but, after this, the principal aim should be to lessen the extreme sensibility and irritability of the ulcer. The ophthalmia then gradually subsides, or, at most, only requires the use of an astringent collyrium.

The best plan is to take a piece of the *argentum nitratum*, scraped to a point, and to apply it accurately to the ulcerated surface of the cornea, until an eschar is formed. The eye is to be immediately afterwards bathed with warm milk. At the instant, when the caustic is applied, the patient complains

of acute pain ; but he is amply compensated for this temporary suffering, by the comfort experienced, a few minutes after the operation.

This sudden production of ease is imputed by Scarpa to the destruction of the irritable surface of the ulcer, and to the eschar, which shields the part affected from the contact of neighbouring surfaces ; but the relief only lasts until the slough is detached. On the recurrence of burning pain at the ulcerated part, and of restraint in moving the eye and eyelids, the surgeon, without delay, is to renew the application of the *argentum nitratum*. The same benefit derived from the previous operation, will be experienced again. In this manner, the caustic is to be used as often as may be necessary. At every separation of the eschar, the diseased sensibility of the eye, and the extent and depth of the ulcer, will be found more and more diminished. The sore also loses its ash-colour, and assumes a pink hue ; a certain mark of its disposition to heal. We must now abandon the use of caustic, and employ merely an astringent collyrium. Towards the end of the case, if relaxation of the conjunctiva should continue, the *ung. hydrag. nitrat.* may be applied.

It is proper to remark, however, that very good surgeons object to this free use of caustic, and begin with tepid astringents, which, if the sore should not heal with them, are to be followed by a slight application of the caustic, or that of a solution of four or six grains of it in an ounce of distilled water.

Slight excoriations of the cornea do not require caustic ; for them, the zinc collyrium, with due attention to the removal of their cause, will be quite sufficient. Also to sores produced by mechanical or chemical injuries of the cornea, caustic should not at first be applied, as it would increase the irritation and inflammation of the eye, and do serious mischief. On the contrary, soothing applications, and antiphlogistic remedies, are best.

Sometimes an ulcer of the cornea assumes the form of a fungous excrescence, which seems to derive its support from a plexus of blood-vessels in the conjunctiva. The proper treatment of this case consists in cutting away the fungus, and extending the incision far enough on the conjunctiva to remove, with the excrescence, the net-work of vessels, by which it was supplied with blood. The blood is to be allowed to flow freely, and the cure completed by occasionally touching the part with caustic.

When ulcers of the cornea have a sloughing tendency, and

the constitution is much debilitated, bark and the mineral acids are indicated.

Staphyloma signifies that disease of the eye in which the cornea loses its natural transparency, rises above its proper level, and even projects between the eyelids, in the form of a whitish, pearl-coloured, or bluish tumor, attended, when the whole cornea is affected, with loss of sight. To this grievance are added, in bad cases, all the evils which necessarily result from the protuberance of the cornea. The inability of closing the eyelids; the exposure of the eyeball to the air, and extraneous matter suspended in it; and the friction of the eyelashes against the tumor; render the eye painful and inflamed; while the constant dribbling of tears is apt to make the cheek and lower eyelid inflame and ulcerate. Even the sound eye itself is sympathetically affected with tenderness, pain, and sometimes actual inflammation.

The opacity being incurable, the only business of the surgeon is to prevent the inconveniences, produced by the projection of the cornea. In recent cases, when these do not prevail, it is best not to interfere with it, as the disease will often remain stationary during life. In inveterate cases, the prominent part of the cornea must be cut off by passing a cataract-knife completely across it. The flap is to be turned up with a pair of forceps, and the incision rendered completely circular with the knife, or scissors. The aqueous humour, crystalline lens, and some of the vitreous humour, usually escape, and the eye is so diminished, that the eyelids can cover it again. The dressings, and subsequent treatment, are the same as those employed after the extraction of the cataract. In particular, a strictly antiphlogistic plan will at first be necessary.



CHAPTER XVI.

PTERYGIUM AND ENCANTHIS.

PTERYGIUM means a preternatural, reddish, ash-coloured, triangular, little membrane, growing from the internal angle of the eye, about the caruncula lachrymalis, and extending towards, or over the cornea, to the great impairment of vision. Although it generally proceeds from the inner canthus, it oc-

casionaly arises from the outer one, and, in some instances, from the superior and inferior hemisphere of the eye. It is invariably of a triangular shape, with its base towards the white of the eye, and its apex towards the cornea, at a greater or lesser distance from the axis of sight. In a few uncommon cases, two* or three pterygia, of various sizes, are met with in the same eye; and their points may even coalesce on the centre of the cornea, so as completely to hinder vision.

The common pterygium, is said by Scarpa to consist of a thickening of the layer of the conjunctiva spread over the cornea; yet be it remembered, that the greater part of the disease, is not at all on the cornea, and that some specimens of the *pterygium crassum* have a deeper origin than any part of the conjunctiva.

A peculiar feature of the membranous pterygium is the facility with which it may be taken hold of with a pair of forceps, and raised in a fold over the cornea, when it extends thus far upon the eye. Sometimes a pterygium assumes a malignant cancerous nature, and then it has a bright red colour, like sealing-wax, easily bleeds when touched, is firmly adherent to the cornea, and occasions lancinating pains, which extend over the whole eye and temple. Scarpa recommends this case to be treated on the palliative plan; but it might be proper to attempt the total excision of the disease: and certainly this measure would be necessary, if it could not be checked by other means.

The ordinary membranous pterygium is not attended with pain, and has no tendency to become malignant. Frequently it does not increase so as to interrupt vision at all, in which case, its removal is scarcely a matter of necessity.

The cure is performed by lifting up the pterygium with forceps, and accurately cutting it away from the surface of the cornea, with a pair of curved scissors. As one part of it is the delicate layer of the conjunctiva, forming the natural covering of the cornea, a cicatrix, and a degree of dimness, necessarily remain after the operation. The opacity, however, is always of much less extent, than the pterygium.

The detachment need only extend as far as the commencement of the sclerotica, and then the separation is to be completed by a semilunar transverse incision,† encroaching not

* Plate 6, fig. 2. Two pterygia, of different sizes, on the same eye. A, the larger one, next the nose; B, the smaller one, next the temple. The straight and semicircular lines on the pterygium, A, denote the double direction which ought to be given to the incision, in extirpating the malady.

† See the shape of the incision, Plate 6, fig. 2.

more than one line on the conjunctiva. The subsequent part of the treatment chiefly consists in preventing inflammation.

An incipient *Encanthis*, is a small, soft, red, and sometimes livid excrescence, growing from the caruncular lachrymalis, and neighbouring semilunar fold of the conjunctiva. In the inveterate state, its magnitude is considerable, and its roots extend beyond the caruncula lachrymalis, along the lining of one or both eyelids. The complaint excites chronic ophthalmy, prevents the complete closure of the eye, and by compressing and displacing the puncta lachrymalia, obstructs the free passage of tears into the nose. The surface of the excrescence is at first granulated like a mulberry; but, after the tumor has become large, only a part of its outside has the above appearance, while the rest seems like a smooth, whitish, ash-coloured substance.

As of pterygium, so there is a malignant species of encanthis, denoted by its dull red colour, bleeding tendency, lancinating pain, excessive hardness, and very fetid discharge. The same practical observations apply to this case, as to the cancerous pterygium.

The cure is accomplished by raising the tumor from its base, and lifting up the elongation, extending along the inside of the eyelids, with a pair of forceps, and detaching them with a sharp bistoury.

No more of the caruncula lachrymalis is to be removed, than is absolutely essential to the success of the operation, in order that an irremediable weeping of the eye may be avoided.



CHAPTER XVII.

DROPSY OF THE EYE.

WHEN the secerning extremities of the arteries, and the minute mouths of the absorbent vessels of the eye, do not act in their naturally reciprocal manner, the organ may become distended with fluid, attended at first with great weakness, and afterwards with total loss of sight. Authors describe one case as proceeding from a morbid increase of the aqueous humour, and another as resulting from an augmentation of the vitreous, combined perhaps with a diseased alteration of the

alveolar membrane, by which this humour is produced. The eye assumes an oval shape, terminating in a point on the cornea, and, as the organ enlarges in all dimensions, it projects from the orbit, so as to cause great deformity, and prevent the closure of the eyelids.

The disease is sometimes preceded by an obstinate internal ophthalmia. In other instances, it is preceded by no inconveniences, except an uneasy sensation of tumefaction and tension in the orbit, a difficulty of moving the eyeball, and a considerable impairment of sight. When the eye has assumed an oval figure, and the anterior chamber has become preternaturally capacious, the iris is situated more backward than natural, and tremulates on the slightest motion of the eyeball. The pupil remains dilated in every degree of light, and while the crystalline is sometimes discoloured in the earliest stage of the disease, sometimes it does not become opaque, before the disease is far advanced.

In the last stage of it, when the eye projects from the orbit, and does not admit of being covered by the eyelids, the same grievances originate as in bad cases of staphyloma. Violent inflammation, ulceration, and total destruction of the eye, may follow, with caries of the orbit, and even a fatal termination. No correct knowledge of the causes of dropsy of the eye has yet been obtained, in addition to the facts, that a slow inflammation of the interior of the eye sometimes precedes it, and that it may be joined with a general dropsical affection of the system. The prognosis is always unfavourable, as far as the restoration of sight is in question. The increase of the disease, however, may possibly be prevented, and, at all events, unless a general varicose state of the organ, and a tendency to carcinoma exist, the several grievances, produced by the magnitude and exposure of the eye, may be obviated. When a dropsical habit attends the complaint, calomel and hemlock, or calomel joined with digitalis, stimulating and mercurial liniments rubbed on the eyebrow, a course of mercury, electricity, and a blister or issue near the diseased organ, may be tried. In other cases, cupping and blistering the temple, or nape of the neck, with various alterative medicines, may be directed. Astringent collyria are generally condemned as hurtful, and tepid emollient applications preferred.

When the large size of the organ brings on the same kind of distressing complaints, as usually attend large protrusions of the front of the eye in staphyloma, the same treatment should be adopted as in the latter case.

A portion of the centre of the cornea, about as broad as a pea, is to be cut off, and as much of the humours then pressed

out as will permit the eyelids to be brought over the eye. A pledget and bandage are to be the only applications, until inflammation has taken place, which is usually about the third or fifth day, when antiphlogistic means and emollients may be useful.

When a fungus grows out of the internal part of the eye, after the operation, and its return and increase cannot be prevented by caustic, the preservation of the patient's life will render the extirpation of the whole of the diseased organ absolutely indispensable.



CHAPTER XVIII.

CANCER AND EXTIRPATION OF THE EYE.

CANCER of the eye mostly begins in the conjunctiva, and seems analogous to carcinoma of other mucous membranes, being at first like it of a comparatively mild character, though afterwards assuming a malignant and fatal nature. In its commencement it is generally restricted to the conjunctiva, which becomes swelled, thickened, and prominent between the eyelids, so as even to hide the cornea. In a more advanced stage, the eyelids, and the lachrymal gland and caruncle, are frequently involved, and sometimes all the neighbouring part of the cheek. The peculiar character of the ulceration, the fetid quality of the discharge, the acute lancinating pains, and the cartilaginous hardness of the fungus, sufficiently prove the very serious and incurable nature of the disease.

Other forms of disease in the eye have also been classed with cancer, especially a case in which the eyeball becomes irregular and knobby, and swells to the size of an apple; the sight is gradually lost; the blood-vessels in the white of the eye enlarge; and the whole external and internal structure of the organ is so altered, that the part resembles a piece of flesh, and no vestiges of its original organization remain. The fungous growths, which sometimes proceed from the interior of the organ after operations for the relief of staphyloma and dropsy of the eye, have likewise a character so malignant, as to be set down as cancerous.

Until lately, fungus hæmatodes of the eye was always confounded with cancer.

Scarpa is perfectly correct in representing true cancer of the eye as less destructive than fungus hæmatodes; first, because it makes its earliest appearance on the exterior parts of the eye, so that whatever relates to the origin and formation of the disease is open to observation; and, secondly, because the cancerous fungus of the eye is very frequently not actually malignant at first, but becomes so in process of time, or from improper treatment, in consequence of which it assumes the real character of scirrhus, and afterwards of phagedenic cancer, during which interval the art of surgery may be resorted to with effect. According to the same writer, we have no pathognomonic symptoms, excepting one, indicative of the exact period when the sarcoma of the eye changes from a benign fungus to carcinoma. The exquisite sensibility, darting pains, rapidity of growth, colour, and ichorous discharge, are by no means a sufficient criterion, and, says Scarpa, the only symptom, if not entirely pathognomonic, at all events less uncertain than any other, is the almost cartilaginous hardness of the malignant ulcerated fungus, which induration is not met with in the benign fungus, and never fails to precede the formation of cancer.*

Under particular circumstances, it becomes indispensably necessary to remove the eyeball; as, for instance, when the organ protrudes from the orbit, cannot be reduced, and the disease creates both great irritation and disfigurement. The operation is also requisite for certain cases of ulcerated staphyloma, and for every form of disease in which the coats and humours of the eye are so altered, as not to admit of being restored to a natural state, and in which the distemper, if unextirpated, would be likely to end fatally, either by extending its ravages to the orbit and brain, or by keeping up such pain and irritation as must ultimately destroy life.

Cancer and fungus hæmatodes of the eye, however, are the two diseases for which the operation is most commonly required.

What is usually called a cancer of the eye does not seem to be nearly so malignant as carcinoma of the breast; for, if the distemper be confined to the globe and the eyelids, and the cellular substance and bones of the orbit continue unaffected, the operation generally produces a radical cure; a fact, strongly dictating an early recourse to that effectual means in surgery, the knife.

In the operation, there are two important circumstances, to

* Scarpa on the Eyes, pp. 511—513. Transl. by Briggs, edit. 2.

which attention must be paid. The first is to remove every particle of the disease. The second is to avoid piercing or injuring the orbit.

In order to be able to separate the eyelids far enough from each other, for the easy removal of an eye that is much enlarged, it is sometimes recommended, in the first instance, to make an incision through them at their external commissure. The patient should lie down on a table of convenient height, with his face exposed to a good light. The generality of surgical writers advise the operator, before he begins the dissection, to introduce a strong ligature through the anterior portion of the diseased organ, by which means the part may be drawn out, or to either side, as the convenience of the surgeon may dictate, while he is making the necessary incisions. Hooks have also been recommended for the same purpose.

The best instrument for the operation is a common scalpel. When the diseased part is very large, a knife, slightly bent laterally, may be used on the temporal side of the orbit for dividing the parts deeply situated in it. The upper eyelid having been raised by an assistant, and the lower one depressed by the surgeon himself, the conjunctiva, connecting the eye with the two eyelids, is first to be divided.

As when the eyeball is enlarged, it mostly falls towards the cheek, so that an incision between the diseased part and the lower eyelid cannot easily be made, Richter recommends first separating the globe from the upper eyelid; then dividing the superior and lateral attachments of the eye; and, lastly, its connexions with the lower eyelid. This mode of operating is said to be the more easy, because the globe of the eye can always be more readily inclined downwards, so as to make room above, than pushed upwards, for the purpose of making room below.

Scarpa, after dividing the external commissure of the eyelids, if the tumor be very large, perforates the conjunctiva at the external angle, and from thence, keeping the knife close to the upper plane of the orbit, as far as the caruncula lachrymalis inclusively, cuts through the elevator muscle of the upper eyelid, the tendon of the greater oblique muscle, and the superciliary nerve. The diseased eyeball being then raised, and the lower eyeball depressed, the incision is next continued along the inferior segment of the orbit, from the external towards the internal angle; by doing which, the knife will penetrate between the eyeball and this muscle, as would happen in cutting in the opposite direction. The eye, freed from these attachments, and from that formed by the nasal branch of the ophthalmic nerve, will fall on the external side of the

orbit, and give the surgeon room on the internal side as far as the bottom of that cavity, where he is to divide with one stroke of the scissors the origin of the muscles of the eye and the optic nerve. He is then gently to bring his finger round to the external side of the orbit, and push its contents a little towards himself, while, with a second stroke of the scissors, he divides all the parts which enter the orbit through the sphæno-orbital fissure.*

As soon as the eye has been completely detached, all the inside of the orbit should be very carefully examined, and whatever indurated parts are found, should now be diligently removed. In particular, the surgeon should introduce his finger along the inner side of the orbit, where he will feel the greater oblique muscle, which he must dissect away by means of a tenaculum and the scissors.

When the eyelids are affected, they should always be removed, to prevent a recurrence of the disease.

As the lachrymal gland is now useless, and particularly apt to be the source of inveterate fungous diseases, if left, it is always to be taken away, whether apparently healthy or not.

The bleeding may be repressed by means of a piece of fine sponge, introduced into the orbit, and a light compress laid over the eyelids. Mr. Travers removes the sponge on the day after the operation, and applies a soft poultice included in a muslin bag, instead of the compress. The practice of cramming the orbit with lint, he justly reprobates.† Sometimes a compress, wet with cold water, or the *lotio plumbi superacetatis*, and put over the eyelids, is the only dressing judged necessary.

When the patient suffers violent pain after the operation, an anodyne should be given. The inflammatory symptoms and fever rarely demand any other means, than a low diet, and aperient saline medicines.

Although the operation mostly succeeds when the disease is

* {When there are not indurated attachments between the appendages of the eyeball and bones, and the operation for removing the eye alone is required, a much easier and more expeditious method of performing it has both been practised upon, and recommended by the Professor of Surgery of Jefferson College, for several years past. It consists, in taking a strong straight-pointed bistoury, and after cutting across the conjunctiva, above and below the ball, near the internal angle of the eye, to plunge it, nearly parallel to the *os planum*, to the bottom of the orbit, and by one stroke, divide the muscles, nerves, vessels, &c. as they pass to the eye. A slight degree of pressure will at once force the eyeball from the socket, and its external connexions may be easily separated by a scalpel or scissors. }

† Synopsis, &c. p. 308.

true cancer, and limited to the eyeball, the same success cannot be expected when the case is fungus hæmatodes.

Sometimes the granulations formed in the orbit are flabby and indolent, in which circumstance, a mild astringent should be applied; as, for instance, lapis calaminaris, pulvis myrrhæ, alumen ustum, &c. If they acquire a fungous appearance, they should be destroyed with caustic. The records of surgery inform us, that in some cases, the cure has appeared perfect for half a year, or more, and then a fungous excrescence has arisen and proved fatal.* Sometimes a few days or weeks after the operation, headaches, vomiting, convulsions, &c. come on, and end fatally. Convulsions after the operation, were suspected in one case to be owing to the pressure of the lint in the orbit on the optic nerve; and hence the late Mr. Ware renounced the plan of introducing dressings within the eyelids.†

Cases present themselves, in which fungous diseases are so confined to a particular portion of the front of the eye, that the removal of the whole organ is unnecessary.



CHAPTER XIX.

FUNGUS HÆMATODES OF THE EYE.

THE best informed surgeons scarcely know what forms of disease should alone be called cancer of the eye. We here meet with no distempers, which exhibit the peculiar scirrhus structure, that is so generally allowed to be characteristic of carcinomatous disease; yet this organ is frequently attacked with certain diseases, which in point of malignity and incurability, are not less dreadful than the cancer of other parts of the body, and have usually gone under the same appellation. Fungus hæmatodes of the eye was one of these cases; but, instead of being allied to cancer, it has a very different and peculiar character, corresponding to that of the same disorder in other structures, some of which are never the seat of true carcinoma.

The second and twelfth chapters of Mr. Wardrop's publication,‡ appear to me highly valuable; the one, as containing

* Mohrenheim, Beobachtungen, band. ii.

† Trans. of Med. Society of London, vol. i. p. 152.

‡ See Obs. on Fungus Hæmatodes, or Soft Cancer, 1809.

a clear description of fungus hæmatodes of the eye, a case which previously had not been distinctly explained ; the other, as furnishing us with an excellent comparative view of this disease and cancer.

In fungus hæmatodes of the eye, the pupil is dilated, has a dark amber, or greenish hue, instead of its natural deep black colour, the iris is motionless, and the sight seriously impaired, or even quite lost from the first. One of the earliest symptoms, however, is a white shining substance in the posterior part of the eye, visible through the pupil in some particular positions of the head ; but not in all ; an appearance, compared to that of burnished iron. As the disease advances, this deviation from the natural appearance of the pupil is discovered to be produced by a solid substance, which is formed at the bottom of the eye, and gradually approaches the cornea. At length, the excrescence occupies the whole interior of the eye behind the iris, and appears through the pupil to be of an amber or brown colour. In this stage of the disease, Mr. Wardrop has known two cases, which were mistaken for cataracts, and, in one of them, an experienced surgeon actually attempted couching. In a case of cataract, however, the opacity lies immediately behind the pupil ; in the fungus hæmatodes, it is deeply situated in the posterior part of the eye. In the cataract, also, the pupil generally retains the power of dilating and contracting in different degrees of light ; but, in fungus hæmatodes, the pupil never varies its size, and is usually dilated.

When the disease advances still further, the form of the eyeball begins to alter, acquiring an irregular knobby appearance ; and at the same time, the sclerotic coat loses its natural pearl-white colour, and becomes of a dark blue, or livid colour. The tumor, by its continued growth, finally occupies the whole anterior chamber ; and, in some cases, a quantity of purulent matter collects between the diseased mass and the cornea.

At last, the cornea ulcerates, and the tumor protrudes, or else it makes its way through the sclerotic coat, so as to be covered by the conjunctiva.

The protruded fungus is generally rapid in its growth, often attains a large size, is of a dark red, or purple colour, has an irregular surface, and is frequently covered with coagulated blood. It bleeds profusely from the slightest causes, and its most prominent parts occasionally slough.

Frequently, the absorbent glands, about the parotid gland, and lower jaw, become affected, sometimes attaining an enormous size.

On dissection, the retina is mostly found annihilated, the

diseased mass extending forwards from the entrance of the optic nerve. Sometimes the tumor pushes before it the choroid coat, and ultimately occasions its total absorption; while, in other instances, this membrane remains in its natural situation, having no apparent connexion with the disease. The morbid growth itself has a medullary appearance; its consistence and colour, however, being subject to some variety. According to Scarpa, the optic nerve and retina are always the structures first attacked. Sometimes the optic nerve becomes thicker and harder than natural, assumes a brownish ash-colour, and loses its natural tubular appearance. Sometimes, it is converted into a tumor, of the figure and size of an olive, the disorganized substance of which exactly resembles that of the fungus, which fills the orbit, and projects beyond the eyelids. In other instances, the nerve is split into one or more pieces, the morbid growth filling up the intervening spaces, and surrounding the different portions of the nerve. It is noticed by Mr. Wardrop, that when the optic nerve is diseased, the alteration in its structure generally extends to its junction with the opposite nerve, and often further, the thalamus being converted into an irregular, soft pulpy mass, more or less blended with blood. Sometimes, the dura mater and pericranium exhibit dark red-coloured spots; and on other occasions, the tunica arachnoides and pia mater are studded with numerous white spots, which, on being cut into, are found to be small bags, or abscesses containing a white viscid fluid like cream.

Children are more subject than adults to fungus hæmatodes of the eye; for out of twenty-four cases, with which Mr. Wardrop was acquainted, twenty were in children under twelve years of age. On the other hand, true cancer of the eye mostly afflicts persons advanced in years.

Children generally lose the sight of the affected eye, before the disease is at all noticed by the parents. In many cases, however, the appearance of the diseased substance at the bottom of the eye, is preceded by a blow, and inflammation of the organ. But when no external violence is concerned, the first perceptible symptom is merely a little fulness of the vessels of the white of the eye. Sometimes, the iris is full of vessels, its colour changes, and the pupil is considerably dilated and motionless. The child seldom complains of much pain; but sometimes appears languid and feverish.

In adults, the disease generally begins without any apparent cause; though, sometimes, it is preceded by a blow. As in children, it commences with a slight redness of the conjunctiva, and an impairment of vision. These symptoms increase slowly, and at length are followed by headaches, which often become

exceedingly agonizing, especially during the night, and continue with violence, until the eye bursts, and the humours are discharged.

In most cases, only one eye is affected with the disease ; but exceptions are recorded.

As surgeons are utterly unacquainted with any internal or external medicines, which have the power of checking or curing fungus hæmatodes of the eye ; and as it is the nature of the disease to extend its ravages till the patient is destroyed, the only chance of preservation depends upon the early extirpation of the affected eye, care being also taken to remove every part in the orbit having any appearance of participating in the distemper. Hitherto, however, with few exceptions, the operation has not prevented the return of the disease, and a fatal termination. When the constitutional nature of the complaint, its extension along the optic nerve, and its usual affection of several organs are considered, this result seems almost a necessary consequence, the great chances of which should at all events be contemplated in any prognosis that may be given.



· CHAPTER XX.

AMAUROSIS,

Or, *Gutta Serena*, is the name given to a weakness, or total loss of sight, arising from disease, whether affecting the structure, or function of the retina, the organ, usually considered as the medium, by which the impressions, received from the rays of light that enter thus far into the eye, are communicated to the sensorium, so as to constitute vision. One of the best divisions of amaurosis, therefore, is into *organic* and *functional* ;* and when the class, to which any particular case belongs, can be recognised in practice, the information is highly important, with reference both to the prognosis and treatment ; for organic disease of the retina, of the optic nerve and thalamus, or of the parts of the brain immediately connected with them by function, are absolutely incurable ; whereas, a possibility of cure attends many examples of functional

* See Travers's Synopsis, &c. p. 139.

amaurosis, unaccompanied with organic disease of the parts constituting the immediate seat of vision, and arising from a kind of sympathy between these parts and others, which are the seat of some kind of irritation, or disease. The truth of this proposition is as evident as the fact, that, if the diminution or suspension of vision depend upon the sympathy of the eye with the morbid condition of another organ, and the latter admit of being effectually cured, before any unfavourable change has taken place in the retina and optic nerve, from too long an interruption of their function, the power of vision may generally be restored. This remark proves also the usefulness of other divisions of amaurosis into *recent* and *inveterate*, *incomplete* and *complete*, &c. the chances of benefit being much influenced by the differences to which these epithets refer. Unfortunately, a great deal of the ill success in the treatment of amaurosis depends upon the connexion of the disease with more causes than one ; for, the case may be both organic and functional at the same time ; and, in addition to the existing disease of some part, which perhaps had a principal share in causing, at first, the functional, and afterwards the organic affection of the retina, there may now be a general derangement of the health, that would leave but little or no hope of recovery, even if the organic nature of the amaurosis did not exist. Such cases might, with much propriety, be named *complicated*.

Amaurosis is mostly attended with dilatation of the pupil ; and a motionless state, or diminished activity of the iris, while the natural black colour of the pupil, and general transparency of the humours, in cases not resulting from severe ophthalmic inflammation, are but little changed. Sometimes, however, even in the complete and most irremediable forms of the disease, the pupil is of its natural size, and the iris capable of motion. In particular instances, the diameter of the pupil is considerably lessened. Although the transparency of the humours is unaffected, a skilful examiner will generally perceive behind the iris, a change in their appearance, the pupil rarely exhibiting the clear, shining blackness, which is seen in a healthy eye. On the contrary, it has a dull, glassy, or horny look, and sometimes a greenish tinge. Occasionally, indeed, it has a whitish opaque appearance, that may cause the complaint to be mistaken for an incipient cataract. These alterations in the natural colour of the pupil are generally ascribed to a thickened opaque state of the retina, producing a reflection of the rays of light from it, and Scarpa regards this symptom as one of a very unfavourable character. In addition to this dull glassy look of the pupil, the aperture seldom retains its per-

fectly circular form, the lesser circle of the iris becoming irregular or angular. The pupil is also more or less displaced, being almost always drawn upwards and inwards. Sometimes, in organic amaurosis, a white or greenish-yellow spot may be discerned in the fundus of the eye, a little on one side of the axis of vision; but it is occasionally observed in persons who complain little or not at all of their sight. Mr. Travers suspects that it may depend upon a deficiency in the secretion of the choroid pigment, an adhesion between the choroid and retina, and discoloration of the latter.*

With respect to the impairment of vision, it sometimes amounts to absolute and complete blindness; but, in general, the patient can distinguish light from darkness, and even perceive bright colours and large objects. The diminution or loss of sight, when not instantaneously produced, as it sometimes is by lightning, apoplexy, or mechanical injury, is always preceded by a defective state of the eye, before which numerous small substances like insects (*muscæ volitantes*,) pieces of cobweb, &c. seem to fly about in the air, especially when the patient looks at a white surface. This symptom is worthy of recollection, as one of the criteria between incipient amaurosis and the early stage of cataract, which last is attended with a simple dimness or cloudiness of vision. In the beginning of amaurosis, the patient in reading misses whole words or lines, which he cannot make out, unless the position of his eye and head be changed for the purpose. Frequently, all objects appear to be surrounded with a tremulous zone of various colours, or the eye is often disturbed by false luminous appearances, even when it is shut, and in a room perfectly dark. Other not unfrequent symptoms of early and imperfect amaurosis are double vision, from an alteration in the axis of sight; the appearance of objects in a distorted shape, or with a colour that does not really belong to them; an obliquity of sight; a degree of strabismus; and severe pain in the orbit, eyebrow, or other part of the head.

All cases of amaurosis may be referred to two classes; one, attended with a diminution in the irritability of the whole eye, the patient constantly preferring a strong light; the other, characterized by great tenderness and irritability of the organ, and aversion to a vivid light. The latter state seems to imply the continuance of a degree of inflammation within the eye, to which the first affection of the retina itself may often be imputed.

* Synopsis, &c. p. 148.

As Mr. Travers has remarked, the history, and concomitant appearances, or morbid states associated with amaurosis, will commonly indicate whether it be *functional* or *organic*. Thus, he observes, diseased changes in the situation, or texture of the eyeball, or in the brain, a hemiplegia, or partial paralysis, with other signs of apoplectic, or other pressure on the brain; an acute, deep-seated inflammation of the eye; a fulness of the superficial vessels of the conjunctiva; a bluish grey tint of the sclerotica; a degree of bulging on one or more sides of the eyeball; or a loss of its sphericity, point out the amaurosis as *organic*. On the other hand, he has known *functional* amaurosis produced by a wound of the scalp, caries of the skull, disease of the antrum, and abscesses about the face, the eye being in all these cases sound, and the orbit untouched by the neighbouring disease. Functional amaurosis may also depend upon immoderate exertion of the eye; disorder in the functions of the stomach, liver, and uterus; sudden and alarming depletion; the suppression of habitual secretions; difficult dentition; worms in the bowels; and the deleterious effects of certain substances upon the organ, or the system. Amongst other predisposing causes are also enumerated sedentary occupations, producing a torpid state of the liver and bowels, and combined with much exertion of the eye upon minute or shining objects, while the head is in a depending position; the use of optical glasses; obstinate amenorrhœa; or constipation of the bowels, with determination of blood to the head in a full habit.*

With regard to the prognosis, when amaurosis is complete, and been of some continuance, no mode of treatment can be expected to restore vision. Complete, inveterate amaurosis, with organic injury of the substance constituting the immediate organ of sight, may, indeed, be set down as a disease absolutely incurable. Amaurosis is generally incurable, when it has existed several years in persons of advanced age, whose sight has been weak from their youth; when it has come on slowly at first, with a morbid increase of sensibility in the immediate organ of sight, then with a gradual diminution of sensation in this organ, to the state of utter blindness; when the pupil is either motionless, and has lost its circular shape, without being much dilated, or when this aperture is dilated in such a degree, that the iris seems as if it were wanting, and its margin is irregular and fringed; when the bottom of the eye, independently of any opacity of the lens, presents an unusual pale-

* See Travers's Synopsis, pp. 142—146.

ness, like that of horn, or else a greenish hue; when the case is attended with universal headach, and a constant sense of tension in the eyeball; when it has been preceded by a violent, protracted excitement of the whole nervous system, followed by general debility and languor; when it is connected with epilepsy; when it is the consequence of severe internal ophthalmy; when, besides being of long standing, it has originated from concussions of the head, blows on the eyeball, or injuries of the supra-orbitary nerve, or from the entrance of foreign bodies into the eyeball; exostoses on the forehead, sides of the nose, or os maxillare; or when it is conjoined with a manifest change in the figure and dimensions of the eyeball. The distorted appearance of objects in an early stage of the disease, was regarded by Beer as an unfavourable omen, because indicating, in his opinion, disease of the brain.

Incomplete recent amaurosis is mostly curable when not produced by any causes capable of permanently injuring the organic texture of the optic nerve and retina, and when the immediate organ of sight retains some sensibility to light. Recent and sudden cases, in which the pupil is not excessively dilated, and its disk is regular, while the bottom of the eye is of a deep black colour; cases not accompanied by any acute and continual pain in the head and eyebrow, nor by any sense of constriction in the eyeball; cases which originate from violent emotions of the mind; disorder of the stomach; plethora; suppression of habitual evacuations; great loss of blood; nervous debility, of not an inveterate nature in young subjects, are all, generally speaking, curable. Amaurosis is also mostly remediable when it is periodical, or comes on during convulsions, the efforts of difficult parturition, and towards the termination of acute, or intermittent fevers.

When the eye is equally free from marks of organic change, as Mr. Travers has justly observed, the slow and the steadily progressive amaurosis is more difficult of cure, than either the sudden, or the rapidly advancing form of the disease.*

Rules for the treatment of amaurosis cannot be of much value, unless founded on a correct view of the causes of the disease, or drawn from successful experience. A great deal of the common difficulty in the cure, I believe, is owing to our ignorance of the causes, to their frequently being various, complicated, and incapable of removal, or, if removable, their effects on the eye cannot be dispersed with them.

* Synopsis, &c. p. 298.

From what has been previously stated, it must be clear, that this is most likely to be the case, when the disease has existed a long time, and come on in a slow and gradual manner.

When functional amaurosis depends upon disorder of the *primæ viæ*, habitual costiveness, and an increased flow of blood to the head and eyes, purgatives are found in this country to answer better, than the free employment of tartarized antimony, in emetic and nauseating doses, so highly praised by Richter and Scarpa. Mr. Travers employs the blue pill, with gentle saline purgatives and tonics. In most of these cases, he observes, we should first aim at the regulation of the visceral functions, and then employ tonics. The blue pill, with colocynth, rhubarb, or aloes, and the combination of soda with rhubarb and columba, he recommends for the first purpose; the mineral acids, bark, and steel, for the second.*

When amaurosis is recent and sudden, and signs of an obscure inflammation are present, Mr. Travers has recourse to mercury, introduced into the system gently, and just sufficiently to make the mouth sore. Dr. Frick has seen much advantage from mercury, or calomel, in cases of incipient amaurosis, attended with deep-seated, and especially an intermittent pain in the head, or orbit.†

In cases, accompanied with plethora, great determination of blood to the head and eyes, or chronic, deep-seated, ophthalmic inflammation, venesection, cupping on the temple, and the occasional use of leeches, are necessary. Besides topical bleeding, the only local remedies which now possess much confidence in amaurotic diseases, are blisters, issues, and the moxa. Any of them may be applied to the nape of the neck, or the blisters may be put over the eyebrow, or on the temple, and either repeated or kept open.

Many of the varieties of functional amaurosis present clear indications: thus, when the disorder is connected with worms, the suppression of habitual evacuations, or immoderate exertion of the eye on minute or shining objects; the first requisite steps to any melioration of the sight must be the removal of these particular causes. Also, when a general bad state of the health and mental despondency are joined with the impairment of vision, these states must, if possible, be obviated by due means; proper medicines and diet; regular exercise in an open carriage, or on horseback, in a dry salubrious air; change of scene, and the pleasures of society.

* Synopsis of the Diseases of the Eye, p. 304.

† On Diseases of the Eye, ed. by Welbank, p. 153.

CHAPTER XXI.

CATARACT

Is the term applied to every kind of opacity in the eye, situated between the vitreous humour and iris, and causing more or less impediment of vision, by hindering the rays of light from duly reaching the retina. The opacity may be in the crystalline lens, or its capsule, or in the posterior chamber between the capsule of the lens and the back surface of the iris, frequently named the uvea. When it affects the lens or its capsule, it is called a *true cataract*; but when it consists of opaque matter, deposited in front of these parts, it receives the name of a *false cataract*. Cataracts are also divided into *idiopathic*, or such as arise from internal, but generally unknown causes, and into *accidental*, which originate from external violence, or active inflammation. The idiopathic generally affects both eyes; the accidental is more frequently confined to the organ that has been injured.*

The idiopathic disease is usually formed with remarkable slowness, and at first may easily be mistaken for amaurosis. In cases of cataract, all objects seem to the patients obscured by a thin mist; and the diminution of vision is exactly in proportion to the opacity manifest behind the pupil. The opacity is first noticed in the centre; seldom, towards the edge of the pupil. Hence, the clear view of such objects as are directly in front of the eye is prevented, while others, laterally situated, may yet be seen with tolerable distinctness. Hence, also, the eye-sight is better in the shade, where the pupil is dilated, than in a strong light, where the iris expands over the transparent circumference of the cataract. As the opacity augments, a black ring is observable round the pupil; and ascribed by Beer to the shadow of the iris upon the lens. To a patient with cataract, the flame of a candle appears surrounded by a whitish circle, which enlarges as he retires from the light; but when the opacity is far advanced, the flame cannot be discerned, and the patient can then merely judge of the distance of its light from the eye. A cataract, in its

* Guthrie's Operative Surgery of the Eye, p. 190.

early stage, does not impair the motions of the iris; and the eye-sight receives assistance from convex glasses.

In amaurosis, the cloudiness in the eye lies far behind the pupil, and has a concave, greenish, or reddish appearance. The diminution of sight is not at all in a ratio to the degree of this deep-seated loss of transparency; the pupil is generally dilated and angular; the activity of the iris lessened, or destroyed; and the brightness of the cornea somewhat changed. The increase and diminution of the eye-sight does not depend, as in cataracts, upon the quantity of light, or the consequent greater or less dilatation of the pupil; but, on a variety of circumstances, augmenting or lessening the sensibility of the retina. Thus, agreeable emotions of the mind, a hearty meal, or a glass or two of wine, will cause a temporary improvement of the sight; while long-fasting, mental anxiety, and every debilitating cause, will have the contrary effect. The flame of a candle, and the zone around it, instead of being white, as in cataract, exhibit the various colours of a rainbow. Glasses afford the patient no assistance, and lateral objects are generally as indistinct as those situated directly before the eye. (*Beer.*)

Idiopathic cataracts affect persons of all ages; but most frequently such as are advanced in years, though the number of young subjects with the disease is considerable, and infants are occasionally born with it. Females are sometimes supposed to be more numerously afflicted than males. Cataracts are not found to prevail with increased frequency in any determinate kind of constitution; neither has previous disease any influence on its formation, unless it should have attacked the part, or the eye generally, by particular and direct sympathy. Scrofula and syphilis are never concerned in the production of a cataract, except when they extend their effects from other parts of the eye to the lens or its capsule, in which case, the disease is not properly idiopathic.* Various examples are recorded in proof of the prevalence and frequency of cataracts in particular families, and of an hereditary predisposition to them; but, as facts of this kind are not very common, and the disease is extremely so, we may conclude with Mr. Guthrie, that, at all events, a family tendency to cataracts is far less frequent, than an hereditary predisposition to consumption, gout, or scrofula.

The consistence of cataracts is a matter of some importance, particularly, because a method of operating adapted to

* See Guthrie's Operative Surgery of the Eye, p. 191.

a soft, or fluid lens, may not be well calculated for one that is firm and hard. A pearl-yellow, or brown colour of the lens, may be considered as indicating a hard cataract; while a white, milky, or striated appearance, rather denote a soft cataract. But, as Mr. Guthrie has observed, the milky colour of a cataract is by no means a certain test of its fluidity; many cataracts, perfectly white, and supposed to be soft, having been found after extraction to be hard; and, on the contrary, pearl-coloured ones soft. The size of cataracts is a better criterion of their consistence than their colour is; for the smaller the lens is, and the darker its colour, the more solid its substance generally is; while the larger, and more protuberant it is against the iris, the greater is the probability of its being soft.*

Writers treat of the *hard*; *caseous*, *gelatinous*, or *soft*; the *fluid*, or *milky*; and the *capsular* or *membranous*, cataracts.

When a cataract is hard, it mostly presents one of the colours above specified; the interspace between it and the pupil is considerable; the patient distinctly perceives the light, and can even plainly discern in the shade, were the pupil not too much contracted, large objects, or bright colours. In the dilated state of the pupil, the black circle around the lens is very manifest; and, as the opaque body does not project against the iris, the motions of the pupil are free and prompt, and the front surface of the cataract is flat, without the least degree of convexity. Cataracts, which occur at an advanced period of life, without previous disease of the eye, are frequently of this description; and it is remarked by Beer, that they may exist many years, without an extension of the opacity to the capsule.

In the *caseous*, *gelatinous*, or *soft cataract*, the lens is thicker and larger than natural, and hence the motions of the iris are considerably obstructed by it. Vision is nearly, or completely prevented; nor is there any improvement of it when the pupil is dilated in the shade, or by the effect of belladonna. The lens is said to have a spotted or flocculent appearance, and no black circle is perceptible around it.

According to Richter, the *milky* or *fluid cataract* is mostly of a white colour, with irregular spots and streaks upon it, the shape and situation of which are sometimes changed by sudden motions of the eyes, or when the eyelids are rubbed over them. The lower half of the pupil is often more opaque than the

* Guthrie, op. cit. p. 208.

upper. The altered lens is large, and the opacity close behind the pupil, which is itself generally dilated. The cataract, by projecting forwards, obstructs the motions of the iris, which are therefore slower and less perfect than they ought to be; while the size and thickness of the cataract render the patient so blind, that he sometimes cannot distinguish the light without difficulty, and his power of vision is not materially improved in the shade, or by the application of belladonna: this is particularly the case when the iris is habitually dilated.

In the *capsular*, or *membranous cataract*, either the anterior, or posterior capsule of the lens may be affected. In the latter case, sight is completely prevented, and but little improved by dilatation of the pupil in the shade, or with belladonna. The opacity seldom begins in the centre of the pupil, but generally at its margin, in the form of small shining spots, or stripes; and it never exists long without the lens becoming affected. If the opacity be restricted to the front capsule, the cataract will have a convex appearance, and seem close to, or even in contact with, the iris, so as to interfere with its movements. When the posterior capsule is opaque, the cataract seems deep in the eye, and its surface concave. As this species of cataract is frequently the result of inflammation, extended to the capsule from neighbouring parts, this membrane is often adherent not only to the lens, but also to the hyaloid membrane.*

A cataract is termed *simple*, when accompanied with no other disease of the eye likely to impair its functions, or with no complaint of the general system: *complicated*, when joined with some other morbid change in the eye, or a constitutional disorder, or particular diathesis, like the disposition to gout, rheumatism, erysipelas, &c.

One not unfrequent complication is an adhesion of the iris to the front capsule of the lens; the effect of previous inflammation, and indicated by an angular deformity of the pupil, the loss of mobility in the attached portion of the iris, and the visible state of the adhesion when the pupil is dilated with belladonna.

Cataracts may be complicated by a diseased state of the vitreous humour, exemplified either in the opaque change of its fluid part, or of the hyaloid membrane, termed *glaucoma*, or else in the total disorganization of it, and the destruction of its cellular texture, called *synchysis*.

A very unfavourable complication of cataract is amaurosis,

* See Beer's *Lehre*, and Frick on *Diseases of the Eye*, p. 161.

the existence of which, however, must not be positively inferred from the state of the dilated pupil, and motionless, or sluggishly moving iris, because these effects may be caused altogether by the protrusion of a large lens against the iris, as frequently happens in cases of soft and fluid cataracts. But, if these states of the pupil and iris be joined with the patient's complete inability to discern the light, amaurosis certainly exists. Cases very difficult of discrimination sometimes arise, especially when the affection of the retina has commenced subsequently to the cataract, and is incomplete.

The only other complications, which need here be mentioned, are general impairment of the eye by frequent attacks of previous inflammation ; its actual presence ; lippitudo ; cirsophthalmia, or a general varicose state of the vessels of the eye ; hydrophthalmia, or a dropsical enlargement of the organ ; opacity of the cornea ; staphyloma ; and incipient fungus hæmatodes.

A favourable prognosis very much depends upon the cataract being free from every complication, both in the eye itself, and the constitution. The best chance of successful treatment attends cases which, besides being unconnected with any of the circumstances or states above specified, have not been accompanied with repeated attacks of severe and distressing headach, or pains in the eye and eyebrow ; nor been preceded, at any period of the patient's life, by epilepsy, or convulsions, the renewal of which may be brought on again by the operation, long after their seemingly permanent cure. In hypochondriacal and hysterical patients, an operation is more apt to fail, than in a healthy individual. The pupil should have its regular circular shape, the iris a power of motion in the varying degrees of light, and the patient be able to discern the light distinctly, and, in shady places, where the pupil expands, even bright colours.

It is still a question in surgery, whether in cases of single cataract, the other eye remaining sound, an operation be advisable. The authorities, and reasoning, which might be adduced in support of the propriety of it, would lead me to recommend at all events a further investigation into the question ; that is to say, a fair trial of the operation in a sufficient number of cases to justify a positive conclusion respecting its utility or disadvantages ; because a few occasional failures do not settle the point. That the plan has answered in many cases, is fully proved by the records of surgery. At the same time, I am ready to admit, that if confusion of vision were to happen only in a very moderate proportion of examples, for instance, in ten out of every hundred operations upon single ca-

taracts, the rest being successful, the practice would hardly seem warrantable, because unless the risk were still considerably smaller, the surgeon would not be justified in exposing to any disturbance the useful degree of vision which the patient enjoys from the possession of one healthy eye. On the other hand, it is to be remembered, that the continuance of a cataract in one eye, has been set down by very experienced men, not only as a cause likely to induce a cataract in the other, but an amaurotic state of the retina in the eye already affected, in consequence of the long suspension of its functions. The question, therefore, involves several important considerations, which should be correctly weighed against each other.

When both eyes have cataracts in them, and the case has no unfavourable circumstances in it, it is not unfrequent to operate upon both at the same time ; but, as Mr. R. Welbank has observed, the saving of a little confinement, the only reason for this method, does not counterbalance the disadvantages arising from the risk of greater inflammation in the eyes, and the danger of an attack of spasm.*

Various internal medicines, and local applications, have been tried for the purpose of dispersing opacities of the lens, or its capsule ; but none of them retain the confidence of experienced men. In a few rare cases, patients have regained their vision, and the pupil has resumed its usual transparency, without any operation ; a change, that has sometimes proceeded from the accidental displacement of the lens from the axis of sight, of which Boyer has recorded an instance.† Spurious cataracts, or those formed in front of the lens by deposits of lymph, blood, &c. may be occasionally dispersed ; but true cataracts, or those occupying the lens, or its capsule, scarcely ever disappear, without an operation for their removal.

In former times, a great deal of preparatory treatment for the operation, was generally adopted ; but, unless the patient be unhealthy, little more is requisite, than a temperate regimen for a few days, and due regulation of the state of the bowels. Timid patients may take a few drops of laudanum a little before the time fixed for the operation ; and if much fulness of habit exist, venesection may be advantageous a day or two previously.

At the present time, three principal methods of operating for the removal of cataracts are practised ; namely, *extraction*;

* Frick on Diseases of the Eye, p. 176, note.

† Traité des Mal. Chir. t. v. p. 509.

couching, or depression; and the breaking of the opaque lens and capsule into fragments, which are afterwards absorbed. However, the latter method is mostly described under the head of couching, of which it has always been regarded as a modification.

Extraction of the cataract is performed by making an incision through the lower segment of the cornea, dividing the capsule, and gently promoting the escape of the opaque body through the wound. The knife for the incision in the cornea, should gradually increase in thickness from its point to its hilt, so that the aqueous humour may not be discharged before the section is completed, and the iris be exposed to injury by falling forwards under the edge of the instrument. Its shape should be such as will permit the incision in the cornea to be finished by one stroke, or movement, and, consequently, its greatest breadth should be at least equal to half of the diameter of the cornea. The broadest part should not be too far from the point, because the nose would then be pricked before the perfect division of the lower part of the cornea had been effected. One of the best knives is that employed by Beer, and represented in plate 3, fig. 3.

As Mr. Guthrie has observed, the position of the patient must necessarily depend upon the surgeon's capability of using both hands with equal dexterity; for, if he can employ only the right, the common position, and ordinary method, are not at all applicable to cases, in which the right eye is to be operated upon.* If he be an ambidexter, he will operate on the left eye with his right hand, and on the right with his left: if not, it will be prudent for him to place himself behind the patient, and divide the upper segment of the cornea in the manner which will presently be noticed. When the surgeon can use both hands with sufficient skill, and even when he cannot, if the left eye be the subject of operation, the patient is to sit on a stool, the height of which is exactly such as puts his head on a level with the operator's breast. Hence, the usefulness of a seat contrived on the principle of a music stool, that admits of being raised or lowered by simply turning a screw, by which means, the most convenient height for the patient's head can be readily arranged. The light, to which the eye is exposed, should not be too strong, because it would render the pupil too contracted; and, in order to make the eye as steady as possible, the other should always be covered with a small compress, or handkerchief.

* Operative Surgery of the Eye, p. 294.

An assistant is to keep the upper eyelid raised with his fore and middle fingers, and at the same time support the patient's head upon his breast. The operator should be seated rather higher than the patient, and rest his right foot on a stool, in order that his knee may be high enough to serve as a point of support for his elbow. The knife is to be held like a writing pen, and the little finger of the hand that holds it, is to rest steadily on the outside of the cheek. With his left fore and middle fingers, he depresses the lower eyelid, and at the same time lets them make a gentle projection against the eyeball, so as to prevent its motion inwards, away from the knife.

When the eye is perfectly quiet, and its position such, that the whole of the cornea is distinctly in view, and especially its inner and inferior segments, the operator is to plunge the knife into this tunic, a little above its transverse diameter, and about half or three-fourths of a line from the margin of the sclerotica. In this first proceeding, it is of great importance to direct the point of the knife obliquely towards the cornea, as if to penetrate the iris. Not unfrequently, the knife is directed in a line parallel to the iris, and hence it happens, especially in elderly persons, where the cornea is much thickened, and the anterior chamber considerably lessened, that the blade is carried for some distance between the laminae of the cornea, and consequently the opening is too small, so that the pressure, and other manœuvres, afterwards necessary to get the lens out of the eye, often do great violence to the iris, occasion profuse loss of the vitreous humour, and become the cause of a subsequent closure of the pupil. The arrival of the point of the knife in the anterior chamber, is indicated by its bright appearance, the part of the blade buried in the cornea being always obscured.* The cornea having been completely pierced, the knife is now to be conveyed cautiously and steadily across the anterior chamber, in a parallel direction to the iris, until its point has passed out of the cornea at a point as nearly as possible corresponding in height and distance from the sclerotica, to that at which it entered. The surgeon should now stop, until the spasmodic action of the muscles of the eye has ceased, which will be in a few moments, when, all pressure on the organ having been removed, the incision of the cornea is to be finished by pushing the knife steadily in the same direction, until its edge descends through the lower portion of that membrane, when the eyelids may be allowed to cover the eye again, until the continuance of the operation is resumed.

* Frick on Diseases of the Eye, pp. 185, 186.

In making the incision of the cornea, care must be taken not to let the point of the knife wound the caruncula lachrymalis, and nose, or its edge cut the iris, when this falls forwards. The first parts are avoided by inclining the handle towards the temple; and the iris may be made to recede from its dangerous situation, by gently rubbing the cornea with the left forefinger.

One of the most essential things in the operation, is to make the section in the cornea sufficiently large for the ready escape of the lens; for, when this is not the case, the force requisite to bring the cataract through the wound, seriously injures the iris, and is apt to excite violent inflammation of it; too often terminating in a closure of the pupil. Hence, if the wound, made with the knife, should not have due extent, it must be enlarged with Daviel's scissors.

The next business to that of making a fit incision in the cornea, is the division of the front capsule of the lens, which should be accomplished with a small steel couching-needle, and not with gold instruments, the bluntness of which renders them ill calculated for the purpose. Some operators make a crucial division of the capsule; while others endeavour to cut it into very minute portions, by repeated strokes of the instrument in various directions. This is done in order that the fragments may escape with the lens, and the risk of a secondary cataract be thereby lessened. In this stage of the operation, a skilful operator always avoids lifting up the flap of the cornea too freely, or displacing the lens, an occurrence that increases the chance of a protrusion of the vitreous humour before the cataract is extracted, the difficulty of doing which is then seriously increased by the sinking of the lens further into the eyeball.* When the iris contracts so considerably as to prevent the safe division of the capsule, the light must be diminished. After this division has been duly accomplished, the lens in general soon escapes through the pupil by the action of the eye itself. If this should not happen in a very short time, the expulsion of the lens is to be promoted by gentle pressure. When its passage forward is still delayed, it is probably retained by an adhesion to the posterior capsule, which is also adherent to membrana hyaloidea. This occurrence, which is not generally attended with an adhesion of the lens to the anterior capsule, is mostly a consequence of previous inflammation. In this emergency, the surgeon is to press upon the lower part of the eye, until the inferior portion

* See Frick on Diseases of the Eye, p. 190. Travers's Synopsis, p. 326.

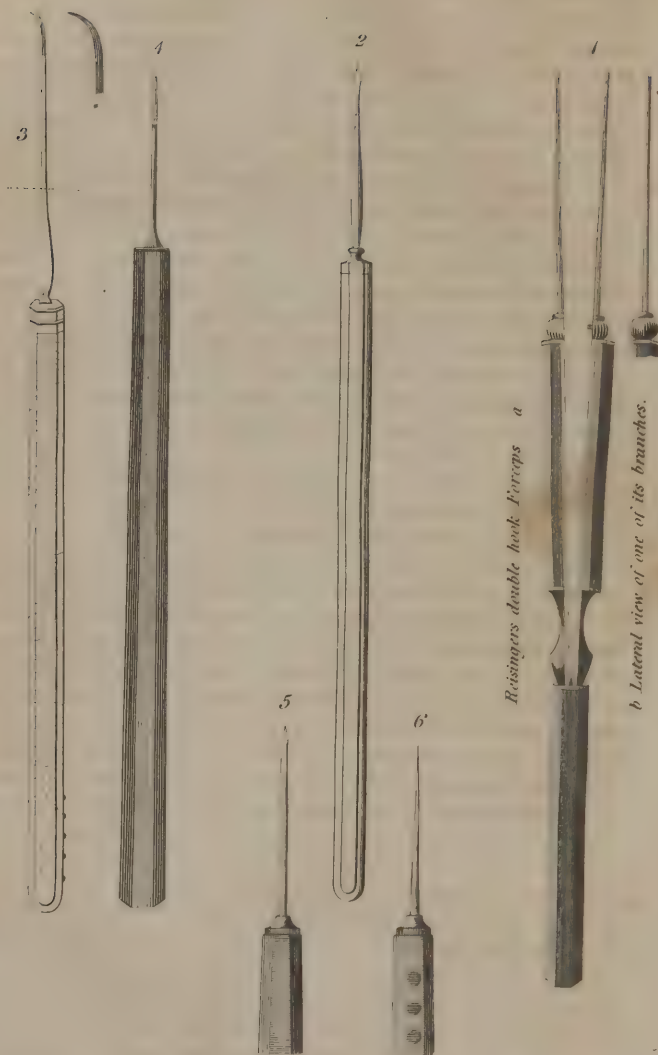
of the lens presents itself, when the curette is to be gently insinuated behind it, and its separation completed. When any fragments of the opaque lens yet continue in the pupil, they are also to be taken away with the curette. Frequently, however, the pupil may be freed from them by gently rubbing the upper eyelid with the forefinger, after the eye is shut. A fine pair of eye-forceps, constructed with a small hook, is usually employed for the removal of any pieces of opaque capsule.

When extraction is to be performed on the right eye, and the surgeon cannot operate with his left hand, he may follow Mr. Guthrie's plan; the upper eyelid is to be raised by the operator, who is to stand behind the patient, and at the same time keep the head steady, either on a low chair, table, or bed. The knife, with its edge directed towards the eyebrow, is to be introduced below the horizontal diameter of the cornea, which is to be divided upwards. Great care must be taken not to wound the upper eyelid, nor let it descend and engage itself behind the flap of the cornea.*

After each method of extracting cataracts, the utmost attention should be paid to placing the flap of the cornea in regular contact with the part with which it was naturally joined, so that its union may follow without any opacity, or uneven cicatrix. Both eyes should then be covered with light compresses, retained by a bandage round the forehead. The patient should be kept in bed, with his head moderately raised; a very low regimen prescribed; and the chamber darkened. If pain arise in the eye soon after the operation, venesection should be practised, or leeches applied to the temple. In general, the wound of the cornea is completely united in two or three days; but, unless there be reason to suppose that the flap has become displaced, or that the iris has insinuated itself between the edges of the incision, the eye should not be examined before the fifth or sixth day, when the compresses and bandage may be taken off, and a green eye-shade applied instead of them. Instead of giving purgatives directly after the operation, it is better that the bowels should be opened previously, so that all bodily disturbance may be avoided for at least a day or two.

The best cases for extraction are those in which the cataract is hard, the eye prominent, the anterior chamber large, the pupil not contracted, the fissure between the eyelids ample, the diameter of the cornea not diminutive, the cataract free

* See Guthrie's *Operative Surgery of the Eye*, p. 320.



Reisingers double hook Forceps a

b Lateral view of one of its branches.

from adhesion to the iris, and from various other local and constitutional complications already detailed.

Couching is a term that has been applied to various operations, performed for the cure of cataracts, with a needle, and has not been restricted to *depression*, properly so named, but extended to the several methods of disturbing, cutting, breaking, and lacerating the cataract, whether it be removed from its natural situation or not. In fact, some kinds of cataracts do not admit of being at once displaced, and pushed out of the axis of vision ; but experience proves, that the disturbance, and breaking of them with the needle, frequently lead to their absorption. The surgeon may employ either a slender spear-pointed needle, like that of Beer,* Scarpa's delicate one with a curved extremity, sharp point, and two cutting edges,† or Hey's fine, round, couching-needle, terminating in a sharp minute edge of a semilunar shape.‡ When the aim is merely to disturb and break the opaque lens, or gently lacerate the front capsule, so that the aqueous humour may have access to the cataract, Saunders's very fine needle§ will answer the purpose.||

The pupil having been dilated with belladonna, the patient and surgeon are to be seated in the same manner as in the operation of extraction. An assistant is to support the head on his breast, and keep up the upper eyelid with the fore and middle fingers of his right hand ; while the surgeon depresses the lower eyelid with those of his left hand. If the curved needle be preferred, it is to be held with its convexity forward, its point backward, and its handle parallel to the temple. The patient having turned his eye towards his nose, the opportunity is to be taken of introducing the needle boldly through the conjunctiva and proper coats of the eye into the vitreous humour, about a line and a half from the margin of the cornea, and a little below its transverse diameter. This

* Plate 7, fig. 2.

† Plate 7, fig. 3. The part between the handle and the dotted line may be advantageously deducted from its length.

‡ Plate 7, fig. 4.

§ Plate 7, figs. 5 and 6.

|| {For operating through the cornea, Mr. Jacobs, of Dublin, recommends the common sewing needle of the size No. 7, as sold in the shops. The point is to be slightly bent and made flat on the two sides, by applying it to a hone. From having seen it used in a number of cases, we are disposed to consider it as affording, occasionally, advantages over the common needle, especially in those cases where it is an object to prevent the escape of any portion of the aqueous humour during the operation.—For Mr. Jacobs's paper on operations through the cornea, &c. see Dublin Hospital Reports, for 1827; also the different Journals of this country.}

place is selected, in order that the ciliary processes and long ciliary artery and nerves may not be injured. The first direction of the needle should be towards the centre of the vitreous humour; but, directly after its point has passed through the coats of the eye, the needle may be guided to the upper part of the lens, which, in the first instance, is to be depressed a little downward with the flat convex surface of the instrument. Thus a space is made between the cataract and ciliary processes, for the safe conveyance of the needle into the posterior chamber, in front of the lens and its capsule. In this step of the operation, care must always be taken to keep the marked side of the handle forwards, so that the point may be turned away from the iris. The needle will now be visible in the pupil, and its point is to be pushed transversely as far as the inner edge of the lens. The handle is now to be inclined forwards, by which means the point will be directed through the capsule into the substance of the lens, and, on moving the needle downward and backward, the former will be lacerated, and carried with the latter deeply into the vitreous humour.

The laceration of the anterior capsule is deemed of considerable importance, because the absorption of the opaque lens is thereby promoted, and a secondary membranous cataract frequently prevented.

When the cataract is *fluid*, its contents flow out as soon as the capsule is pierced, often rendering the whole of the aqueous humour so turbid, that the iris and needle are completely hidden. The surgeon should not be disconcerted by this event, but endeavour, as far as he safely can, to lacerate the capsule, and leave the opaque matter in the chambers of the eye to be absorbed, which will often be the case in a few days.

When the cataract is *soft*, and will not admit of depression, the surgeon should freely break and cut it into fragments, taking care not to spare the capsule, and pushing as much of the opaque matter as he conveniently can, forward into the anterior chamber, where absorption is carried on more vigorously than behind the pupil.

When the case is a *secondary membranous* cataract, the surgeon is to turn the point of the needle cautiously towards the pupil, and pierce the opaque capsule, which is to be broken as far as it is practicable, at every point of its circumference, and the fragments either left in their situation, or pushed through the pupil into the anterior chamber.

When the capsule is adherent to the iris, the attachment may often be broken by skilful and delicate movements of the needle, the cutting edges of which may here be found

useful. If the operator prefer a straight needle, he may also imitate Scarpa, and depress the cataract a little in the first instance, so as to make room between the lens and the ciliary processes for the passage of the needle in front of the opaque body. The generality of surgeons carry the needle directly across the posterior chamber, between the iris and the cataract, until its point is beyond the nasal edge of the pupil, with one flat surface towards the lens, the other towards the iris. They then place one of its flat surfaces on the upper part of the lens, which is depressed more or less deeply backward and outward. That it should not be forcibly propelled too far backward, so as to injure and press upon a part of the retina essential to vision, I think must be as manifest as the contrary fault of not carrying the depression far enough, which must leave a risk of the return of the lens to its former situation, or of a dangerous degree of iritis from its lodgment against the uvea.

Reclination, a term of which so much is now heard in surgery, consists in turning the opaque lens, so that its anterior surface may be upwards, and its posterior surface downwards, in which position its depression is effected. The dilatation of the pupil, by means of belladonna, is a very useful preparatory step in this operation. The needle may be introduced, either at the place usually preferred in the ordinary mode of depression, or through the cornea and pupil, a method distinguished by the name of *keratonyxis*, which is of two kinds. The first is that of Conradi, Beer, and Saunders, for destroying a central portion of the capsule, equal to the size of the pupil, with or without a very gentle opening of the texture of the lens. The second is that of Buchhorn, Langenbeck, Walther, and Reisinger, in which the whole of the lens is broken, the capsule destroyed, and the pieces brought into the anterior chamber. For details of the plans of performing these operations, I must refer to Mr. Guthrie's work.* After their completion, the eye must be covered as after extraction, means taken to prevent inflammation, and the pupil kept dilated with belladonna, until all risk of the iris contracting adhesions is past.

With respect to the choice of a method of operating, I have already specified the circumstances favourable for extraction. When there is reason to believe the cataract hard, but the case is attended with some condition prohibiting extraction, depression should be preferred.

* Operative Surgery of the Eye, p. 333.

Soft cataracts are most calculated for plans, in which the main object is to divide and break them into fragments, which, when conveniently practicable, are to be pushed forwards into the anterior chamber, where they are more quickly absorbed, than behind the iris. Membranous, or capsular cataracts, are manifestly not adapted for depression; neither are they well suited for extraction, except where the capsule presents itself in an opaque state, directly after the lens has been extracted, in which case, it should be taken out with a pair of eye-forceps. In all other circumstances, membranous opacities are most advantageously removed by means of the needle, with which they are to be lacerated, broken, and displaced from the axis of vision.

Congenital cataracts are mostly capsular, and attended with a complete, or partial absorption of the lens. Hence, and also on account of the unsteadiness of children, the proper operation is that of dividing and breaking them with a sharp-edged needle. The late Mr. Saunders was accustomed to operate at any time between the ages of eighteen months and four years; but Dr. Farre considers that of two years the best period. The upper eyelid was kept up with Pellier's elevator; and the child laid on a table, parallel to a window, from which the eye, about to be operated upon, was farthest. Four assistants, and when the child was stout, five, were required to confine it. The pupil was dilated with belladonna, previously to the operation, and kept so afterwards, until all danger of the iris becoming adherent to any portion of the capsule was past. Mr. Saunders had two modes of operating; one corresponding to what is now called *keratonyxis*, that is, the needle was introduced through the cornea and pupil. The other method consisted of the division and laceration of the opaque membrane with the needle, introduced in the manner usually followed in couching, namely, behind the iris. The anterior operation was ultimately preferred, because it inflicted slighter injury on the eye, did not disturb the ciliary processes and vitreous humour, and produced less inflammation, than the other method. One peculiarity in most of Mr. Saunders's operations, was that of opening and destroying chiefly the central portion of the capsule, and, if the lens was present, gently opening its texture, without displacing it. This plan mostly requires several repetitions of the operation, which are the strongest objections to it. Modern operators, I believe, find a freer disturbance of the cataract, and the displacement of the fragments from the pupil, on the whole, better practice. However, one fact in favour

of Mr. Saunders's method, is very strong, namely, out of sixty cases operated upon by him, fifty-two were successful.

Among the arguments, mentioned in favour of operating early, two in particular merit attention. First, when the patient has no perception of external objects, the muscles acquire so inveterate a habit of rolling the eye, that, for a very long time after the pupil has been cleared by an operation, no voluntary effort can control this irregular motion, nor direct the eye to objects, with sufficient precision for the purpose of distinct and useful vision. Secondly, the retina, when not exercised for a long while, is apt to lose a degree of its sensibility.*

* See a Treatise on some Practical Points relating to the Diseases of the Eye, by the late J. C. Saunders; to which is added, His Method of Curing the Congenital Cataract, by J. R. Farre, M. D. 1811. Of this work, there have now been several editions.

NOTES

BY

A. H. STEVENS, M. D.

ONE OF THE SURGEONS OF THE NEW-YORK HOSPITAL.

NOTE A.

Page 5.

There exists in some inflammations a phenomenon which seems to favour the idea of *error loci*: for instance, when a part, naturally white, and in which the eye can discover no red vessel, becomes inflamed, it assumes a red colour, more or less deep, which might be attributed to the passage of red blood into the lymphatic vessels. But in all parts, even those that are the whitest, the blood circulates, and its globules preserve the red colour, which is essential to them. Now, since the sanguineous vessels of these parts are extremely delicate, and receive, so to express it, only single globules, they do not show a red colour; in the same manner, a drop of coloured liquor, in a transparent capillary tube, or a plate of coloured glass, extremely thin, appears white.

But, if several globules of blood united, enter, successively, a vessel, through which they do not thus pass in the natural state, they will show, through the thin transparent walls of this vessel, their red colour, in a manner precisely similar to several united drops of coloured liquor in a transparent tube. In this way the sclerotica, the skin, and, in general, all parts of the body which are naturally white, become red by inflammation. There is no need of recurring to *error loci* in order to explain this phenomenon, which is, beside, disproved, as we have seen, by anatomical experiments.—*Boyer's Surgery*, vol. i. pp. 5 and 6.

NOTE B.

Page 51.

The utility of blisters, applied in strips over the sound parts immediately next those which are gangrenous, a remedy for which we are indebted to Dr. Physick, is too universally known and acknowledged in this country, to require more than a passing notice.

The pyroligneous acid, the use of which was first suggested to me by my friend, Dr. S. W. Moore, of this city, promises to be a very valuable topical application; not only in cases of mortification, but in sloughing, and all other fetid ulcers. The method I have adopted, is, to cover the surface of the ulcer or slough with lint, or soft linen rags, and to wet them frequently with the acid. With many ulcers it agrees better than the nitric acid, or

yest poultice, and is altogether superior to either in its powerful antiseptic qualities. The most intolerable fetor is removed by it. No one who knows how essential it is in cases of mortification and of phagedenic ulcers, to keep the stomach of the patient in good order, but will think highly of a remedy of such powers. I have not had an opportunity of testing its efficacy in removing the fetor of patients, in low fevers, when applied to the skin by means of a sponge, or otherwise; but I venture to hope, that it will be found highly useful in such cases.

NOTE C.

Page 71.

These directions for the constitutional treatment of erysipelas, are not at all applicable to the disease as it appears in this country. There are few severe cases, in which, at least, one large bleeding is not proper, and, indeed, indispensable. In many cases, venesection requires to be repeated several times, and the whole of the antiphlogistic regimen strictly enforced.

NOTE D.

Page 74.

Several cases have been published in the *Medical and Physical Journal*, published by Dr. Chapman, by Dr. Dean, intended to illustrate the use of mercurial ointment as a topical application in erysipelas. Dr. Chapman mentions, that Dr. Physick has applied it with great advantage. Other cases, illustrating its utility, may be seen in the *Medical Recorder*, of Philadelphia, and the *Medical Repository*, of New-York.

NOTE E.

Page 83.

I believe it is not common to meet with cases of carbuncle in which the chylipoietic organs are not disordered. Such a case has not occurred to me; and effectually cleansing the *primæ viæ* is a primary and indispensable object in every case.

NOTE F.

Page 84.

Doctor Physick has revived the ancient practice of cauterizing carbuncles, of the success of which he speaks in high terms. See *Philadelphia Medical and Physical Journal*.

I have no experience of this practice, but I cannot agree with Mr. S. Cooper in advising the use of emollient poultices. It is contrary to the advice and practice of the best surgeons, both in Europe and America; who, with few exceptions, agree in the propriety of using stimulating applications. Yest is highly recommended by Dr. Hosack, and is pretty generally employed in New-York. Mr. A. Cooper recommends spirits of turpentine, diluted with two parts of olive oil. After opening the carbuncle, I commonly direct it to be smeared over with warm spirits of turpentine, and apply a yest poultice. It is often necessary to support the constitution with ammonia and opium, and a generous diet. I have known Fowler's solution administered

with great advantage, in this, and other species of mortification arising from constitutional debility.

Mr. A. Cooper observes, in his lectures, that he never knew an instance of recovery from carbuncle situated on the head; the patients generally dying comatose on the third or fourth day.

NOTE G.

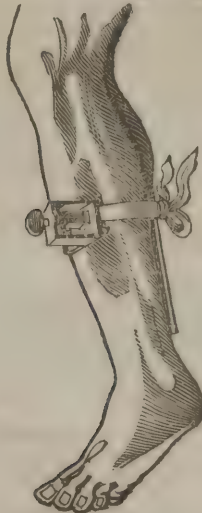
Page 132.

After applying a ligature to the subclavian artery above the clavicle, in a peculiar case, preparatory to amputating at the shoulder joint, I found the blood flowing from the divided end of the axillary artery, in the course of the operation, and it became necessary to apply a ligature to that also. This was owing, as afterwards appeared, to the first knot having loosened itself before the second was applied. The surgeon's knot is not liable to this accident, and should be preferred, I think, on that account.

NOTE H.

Page 134.

Annexed is a representation of a tourniquet, invented by Dr. Moore, of Massachusetts, and particularly described in the *New-England Journal*, applied so as to compress the anterior tibial artery. Besides answering all the purposes of a common tourniquet, when applied without the splint, it may thus be made to compress very effectually a single artery.



NOTE I.

Page 149.

Where a person has received several wounds, it will, in general, be found most advantageous to begin by dressing those which are least painful, so that he may be left undisturbed immediately after the most painful operation.

NOTE K.

Page 165.

In recommending cold washes as useful in contusions, and around the edges of lacerated wounds where the skin is not broken, Mr. Cooper does not mean, I presume, to advise them to be applied immediately after the accident. Until the chilliness and first nervous symptoms pass off, and are succeeded by increased zeal and fulness of the pulse, they can be of no utility, but are rather calculated to do harm, by increasing the severity of the cold stage.

NOTE L.

Page 171.

If we may trust to the statements of Mr. C. Bell, the danger of secondary hemorrhage, after gun-shot wounds, is greatly exaggerated, if not entirely groundless.

"In the first place, I positively deny that, because a gun-shot wound bleeds, there must, therefore, be a great artery wounded : for I have seen wounds of the thigh, of the axilla, and arm, by musket balls, where much blood flowed, and yet there was no secondary hemorrhage, and no great artery wounded, as the event of the cases showed.

"It would be great presumption in me to contradict the opinion of Mr. Hunter, upon a subject of this nature ; yet, as I have felt alarms in consequence of what he says, and others think they have confirmed, and have found my fears groundless, I think it necessary to state, that, while I would still take the precaution recommended in regard to the secondary hemorrhage from gun-shot wounds, yet I do not think there is that occasion for trembling anxiety, which I, at first, conceived there was. On a late occasion, when I went among the wounded from Corunna, I had two purposes in view : first, to satisfy myself on several points of which I had just knowledge sufficient to make me doubt the received opinion. The other was, that I might have striking instances of acknowledged facts, for the purpose of teaching ; and, among other accidents, I thought we should have secondary hemorrhagy. I hope it will not be irrelevant if I state, from my notes, the opinion as it grew.

"It is singular that, among all the hundred wounds of balls in these wards, with slough hanging from the wounds, there is no instance of hemorrhagy.' In succeeding mornings I find the same expression in my notes. 'Now the slough is just coming out of these wounds, in cases, too, where I should imagine the artery must have been touched ; yet, in bringing the men ashore, there has been no bleeding. I see a man wounded in the sartorius, very near the femoral artery.'

"I found no instances of secondary hemorrhagy. I began to think it was equally incorrect to say, that every artery touched with a ball must slough and bleed, as it is to say, that every bone touched by a ball must exfoliate.'

"This case is, in no respect, different from the secondary hemorrhagy after amputation, when there is a sloughing stump."—*Operative Surgery*, vol. ii. pp. 423—425.

NOTE M.

Page 218.

I have been greatly embarrassed in removing encysted tumors about the orbits of the eye, after the common method of dissecting the sac out whole. The following observations of Mr. A. Cooper, appear to me altogether just.

"The common mode adopted for their [encysted tumors] removal is, to dissect them out whole; but the best manner of doing it is to make an incision into them, and then, by pressing the sides of the skin together, the cysts may be easily everted and removed. If it be attempted to be extracted whole, the dissection is most tedious, and before it is completed, the cyst is either cut or burst; so many incisions and so much pain may be readily prevented by opening it freely by one incision; and raising its edge between the forceps, dissect it from its adhesion to the surrounding cellular membrane. When a swelling of this kind, in the scalp, is to be removed, the surgeon makes an incision from one side of the tumor to the other, directly through its centre; and its contents, which are solid in this situation, are directly discharged in form similar to the tumor; then a tenaculum is put into the cyst to raise it, and it becomes most easily separated. In half a minute the operation may be accomplished, and with scarcely any pain. The hair is then braided together from each edge of the wound, and the edges are thus approximated, being clotted together by means of blood. Pressure upon the little vessels, which are divided in this simple operation, will be sufficient to stop the bleeding.

"The swelling of this description which takes place at the outer canthus, is the most difficult of these encysted tumors to remove; it passes within the orbit, and often adheres to its periosteum, and the inner part of the cyst is, with great difficulty, reached. The operation of removing it is always very tedious and painful.

"The removal of encysted tumors is not entirely unattended with danger. I have seen three instances of severe erysipelatous inflammation succeed the operation of removing those swellings upon the head, and I believe it is owing to the occipito frontalis being wounded when they are attempted to be dissected out whole. It is well known, that in cases of injury of the head, when this tendon is contused and inflamed, the inflammation often extends over the head and face. Trifling as the aperture appears which is occasioned by this operation, care must be taken for a few days after it, when the swelling is seated on the head.

"A lady had an encysted tumor removed from the scalp. Three days afterwards she went into a cold bath; soon after she left the bath, she was seized with a rigour and severe pain in the head; an erysipelatous inflammation succeeded upon the head and face; and, notwithstanding she had promptly the most able medical assistance in Dr. Baillie, she fell a victim to this inflammation."—*Surgical Essays*, part 2d.

NOTE N.

Page 229.

Boyer contends, that encysted tumors never become cancerous.

Many wens are enclosed in a particular cyst, or sac, situated immediately below the skin. Others have no such cyst, and are contained in cells of greater or less size. Hence the distinction of tumors into encysted and not encysted. The matter contained in encysted tumors, "is sometimes limpid and serous, forming an hydropic encysted tumor; sometimes it is lactescent or sanguineous; but most commonly the matter is yellow, viscid, and of the

consistence of honey, or of a greyish white colour, and gramous. The former is called *meliceris*, the latter *atheroma*."—*Boyer's Surgery*, vol. ii. p. 345.

Meliceris and atheroma are always less dangerous than steatoma, because they never grow so large, and never terminate in cancer.—*Opus. Cit.* vol. ii. p. 348.

NOTE O.

Page 239.

Young women are very frequently subject to an irritable swelling of the breast. It occurs most commonly between the ages of 17 and 25. A slight swelling of the lobes of the breast often occurs at this period of life. This sort of swelling of the mamma has no circumscribed basis. It seems to be rather an irritable inflammation of the glandular substance of the breast, than a distinct swelling. It is somewhat hard, and it is characterized by its excessive tenderness. When it is touched with the finger, the patient shrinks back and complains of being hurt. Even the pressure of the clothes is painful. The breast often remains in this state for months, and even for years. The pain excited by pressing upon it, continues all day, and extends down the cutaneous nerve of the arm, and is altogether disproportioned to the apparent disease existing in the part.

This affection seems to be connected with diseased uterine functions. The menstruation is sometimes scanty, and at other times profuse. It attacks, most frequently, pale and delicate females, of irritable habits and strong passions. It never terminates in cancer. The application of leeches is very useful. Sir Astley Cooper recommends a course of bark and soda, with small doses of calomel and cicuta, taken the same day; the first late, the latter early; and as a local application, oiled silk, rubbing the breasts with an ointment of camphor \mathfrak{z} i, spermaceti \mathfrak{z} i. Pregnancy cures this complaint.

I have seen an operation performed twice on a breast affected with this disease, which returned as soon as the suppurative process, consequent to them, had ceased.

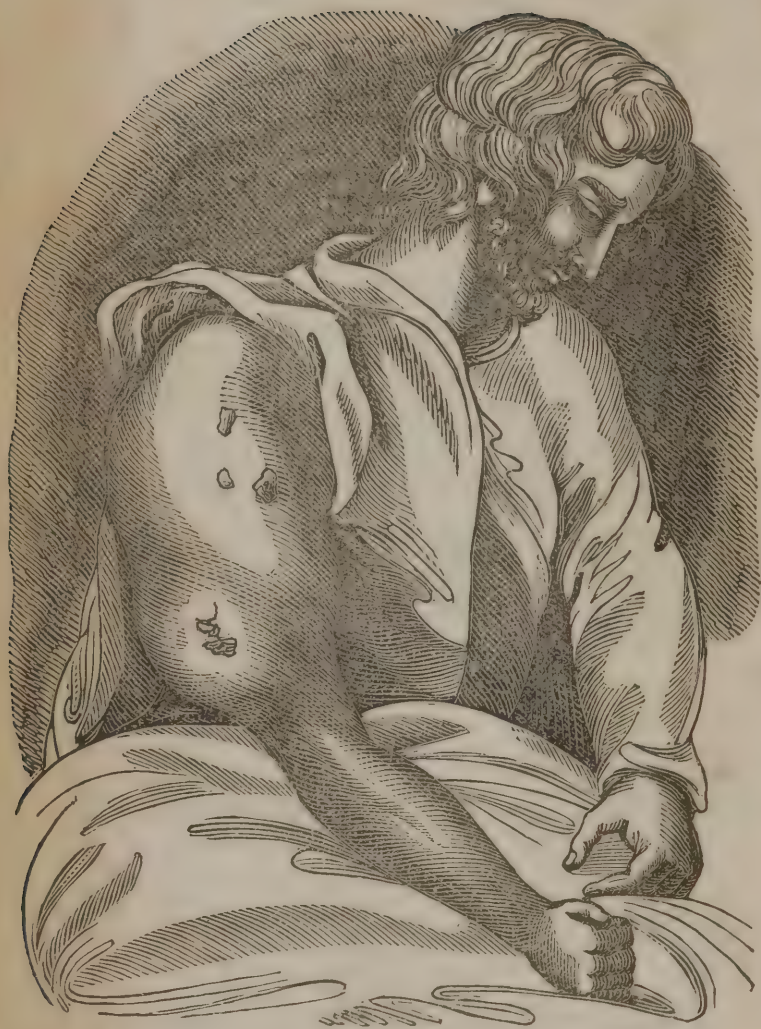
NOTE P.

Page 291.

The foregoing chapter will be read with great interest by those who have considered mercury necessary in all sores on the genital organs; but, while the practice is so unsettled as it is at present, I cannot think, that any prudent practitioner will deem himself justified in treating chancre and its consequences without mercury. The statements of the British army surgeons are indeed imposing, and I find it difficult to reconcile them to my individual experience, without supposing that the venereal disease is, at present, different in this country from what it has been in Great Britain, within the last ten years. I have studied the subject with care, and my opportunities of observation have not been very limited, and I freely declare, that I have met with few cases of chancre, (I speak of what Mr. Hunter defines to be such) which would heal without the use of mercury, or, which having yielded, were not followed by secondary symptoms. The proportion of chancre to other sores, on the genitals, I have found about as one to three; and of eruptions, about one-half that I have met with have been of the scab kind, with a depression in the centre, and these have uniformly required the use of mercury. Sarsaparilla and guaiacum would partially relieve them; and other eruptions would get well under the use of these articles.

This subject is too extensive for a full discussion in this place; but it appeared to me, to require this slight notice.

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NOTE Q.

Page 318.

The annexed plate is the representation of an otseo-sarcomatous tumor of the humerus. It commenced, without any known cause, below the insertion of the deltoid muscle, about six months before the sketch of it was taken. It was not much painful until it had attained considerable size, when the health of the patient began to be impaired, his appetite failing, and his nights being passed without sleep. By the advice of an eminent surgeon, to whom he applied when the tumor was smaller than a hen's egg, it was blistered repeatedly, without benefit. It had an obscure feeling of fluctuation, especially in the most prominent points, which induced an ignorant practitioner to puncture it. Only blood and bloody serum were discharged. As I had foretold, that such would be the consequence, if opened, he immediately resolved to take the advice previously given him, and enter the Hospital in order to submit to the removal of his arm at the shoulder joint. The integuments were not much discoloured, but tense and somewhat red. The humeral artery was very much enlarged, and beat with unusual force.

After consulting with my colleagues, Drs. Post, Mott, and Cheeseman, the patient was brought into the theatre of the Hospital on the 15th of June, 1821, the day of his admission, and compression was made on the subclavian, as it passed over the first rib. I found it required so much force to arrest the pulsation of the axillary artery, that I could not feel safe in dividing that vessel, and the numerous enlarged branches about the axilla, without previously securing more effectually the subclavian artery, either by subjecting it to direct pressure, or by tying it. By pressing upon the external veins of the neck, so as to distend them, I found the external jugular giving off a branch nearly as large as itself, running from the side of the neck towards the upper acromial end of the clavicle. Drawing down the skin of the neck, especially that over the sternal end of the clavicle, I cut through the integuments, platysma-myoides, and the fascia of the neck, along the middle of this bone, from the external edge of the external jugular vein to the inner edge of the large vein of which I have spoken. Thus, when the integuments retracted, the course of the wound was along the middle of the clavicle, inclining outwards and a little downwards. A small vessel was cut and tied. By depressing the shoulder, the edge of the anterior scalenus was brought into view. I hesitated a moment, whether I should now have the subclavian artery compressed by the finger of an assistant during the amputation, or should place a ligature around it. The latter was determined upon. By the aid of Colis's curved spatulas, the sides of the incision were drawn asunder, and the omo-hyoides drawn inwards, and I cautiously removed some cellular and adipose substance in the triangular space, and exposed fairly the axillary plexus. I felt now the artery very distinctly under the upper nerve, and, cautiously dividing some dense cellular membrane over it, I there secured it by passing from above downwards a blunt needle, with the ingenious instruments of Drs. Parish, Hewson, and Hartshorne. The vessel was embraced in two single knots of a double silk ligature. The arm was then removed after the manner recommended by Sharp, the diseased state of the integuments rendering that plan most expedient. Although one of the assistants had announced the cessation of pulsation in the radial artery, the axillary artery gave out blood when it was divided, so that it was necessary to secure it as well as some smaller vessels, owing, as I conclude, to the first knot on the subclavian having loosened itself, before the second was applied.

The wound was long in healing; the ligature on the subclavian did not come away until the sixtieth day; and even at the expiration of three months

after the operation, the man in the mean time having suffered much pain, there was a small fistulous sore in the axilla.

After four or five months of comparative comfort, I perceive with regret a return of ulceration, a fungus shooting out, attended with hardness around the shoulder, especially near the pectoralis major.

DISSECTION.

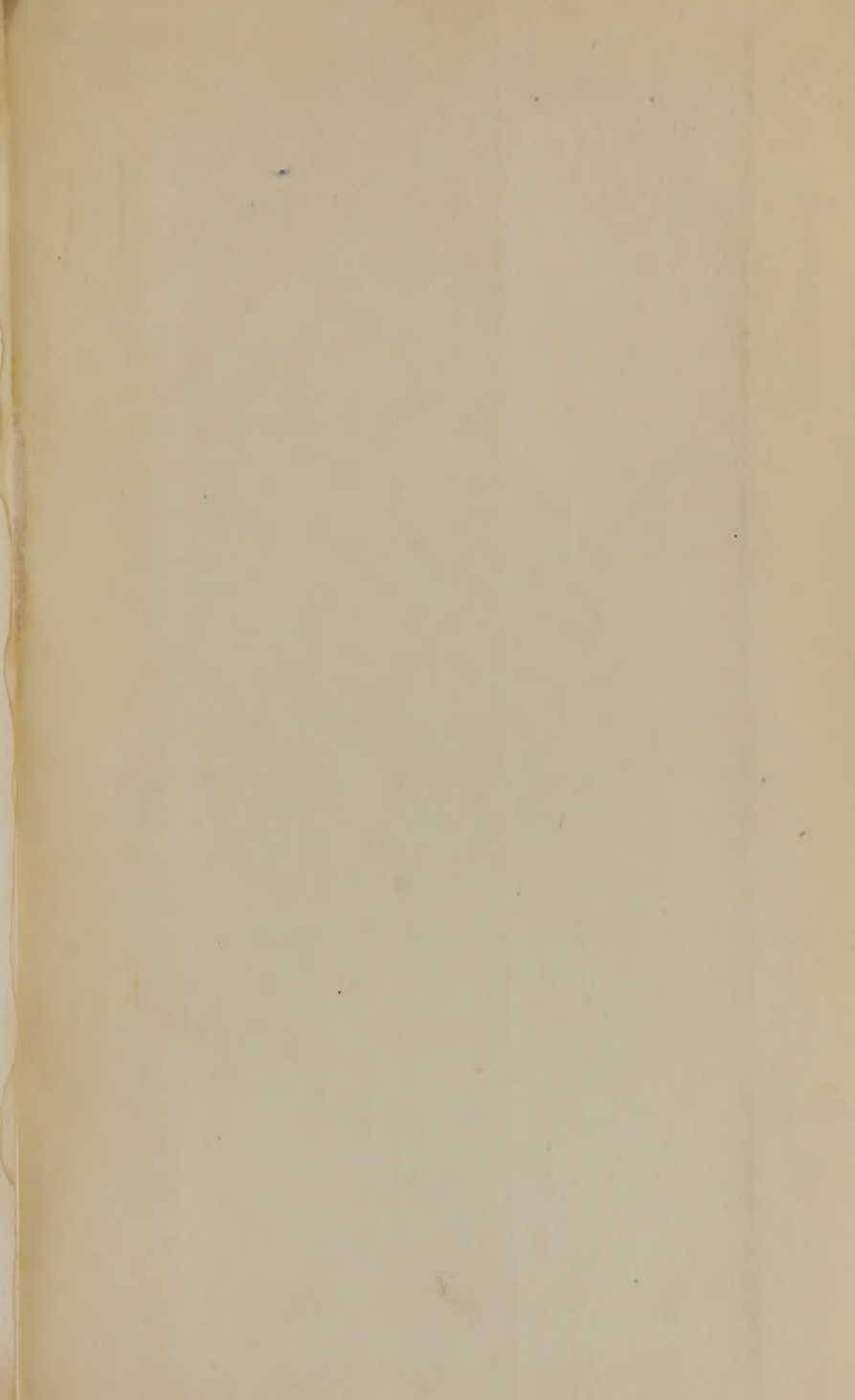
The first incision, in amputating the arm, confirmed the apprehension entertained of the malignant character of the case. The knife encountered spiculæ of bone, and accidental pressure of the hand squeezed out a brown gelatinous matter. The humerus was found entirely separated about the middle. The cartilage, at its head, was healthy, and in other respects entirely corresponding to the description of the malignant exostosis of A. Cooper; and the osteo-sarcoma of Boyer, Gibson, and others. The separation of the humerus, which had not been suspected, fully accounted for the caution with which the patient had moved, always supporting it with a sling and with the other hand, and not being able to endure the pain of having it raised from the side. Such are the important particulars of an operation, undertaken with more reluctance than any I have ever performed, and supported with more fortitude than any I have ever witnessed.*

NOTE R.

Page 369.

If the child is able to suck, I believe the operation ought never to be performed, until about the age of two years, or until all the teeth are formed. Children not only die frequently after an operation, performed in the early months, but the cure is always more or less imperfect, and often the operation requires to be repeated. I have found the interrupted suture more convenient than any other means of keeping the divided surfaces in contact. If one of the coronary arteries bleed, introduce the needle, first (a straight needle with a triangular point is most convenient,) on that side where the bleeding occurs, and bring its point out close to, or, if possible, through the mouth of the bleeding vessel. This effectually stops the hemorrhagy.

* A most interesting case of aneurism of the right subclavian, in which Doctor Mott tied the arteria innominata, may be seen in the New-York Hospital Register, No. 2. The patient lived to the 26th day.



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